FACULTY OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

UNIVERSITY OF MALAYA

WXES 3181/3182

WEB-BASED DIRECTORY OF LIBRARIES AND INFORMATION CENTERS IN MALAYSIA

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Abstract

Dyflicia (Directory of Libraries and Information Centers in Malaysia) is a web-based system that provides information on libraries and information centers in Malaysia. This system provides an interactive search and browse function to make the retrieving of information faster and easier for the users. The Dyflicia's members include the Directors of a library or Information Center and the System Administrators. The Directors will register his or hers institution and they can maintain the information from time to time. The System Administrators will use the Management subsystem to manage the institution records and registration, members and the feedback from the users.

This report begins with the introduction part. The introduction part consists of the project definition, objectives, target users, scope, limitations, schedule, expected outcome and the report layout. It is followed by the literature review which includes the approaches to literature review, existence system analysis and comparison and technical aspects discussion. Next is the methodology for developing Dyflicia. Here, the waterfall life-cycle model which will be used is discussed.

The report continues with the system analysis which includes the user functional and non-functional requirements. The technical requirements analysis is also included in this chapter which covers the software and hardware requirements. The next chapter is the system design which includes the system structure design, application architecture design (context diagram and data flow diagram), system database diagram, and interface design.

After system design, comes the system implementation, which discusses the implementation aspects of Dyflicia. System testing comes next which discusses the testing that is done on Dyflicia. The report ends with system evaluation and conclusion which stated Dyflicia's strength, limitations, future enhancement, problems faced and a brief conclusion for the whole theses.

Acknowledgement

Firstly, I would like to take this opportunity to thank my faculty, Faculty of Computer Science and Information Technology, University of Malaya for giving me the opportunity to develop this system (Dyflicia).

My foremost gratitude goes to my supervisor, Dr. Diljit Singh, for his advice as well as his guidance which helps me to complete this thesis. His precious guidance may never be forgotten and can never be measured with time and money.

My gratitude also goes to my moderator Puan Kiran Kaur Gurmit Singh for her attention and interest on my thesis. She also gives me her precious advice on how should I make my system better. Without her valuable input, I will never realize that my system is still not good enough in its functionality.

Last but not least, my deepest gratitude goes to my family and friends for their advice and support throughout the completion of this system. Their input and feedback on Dyflicia are highly appreciated.

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Chapter 1: Introduction

1.1 Project Definitions

Library and Information Centers are very important places for everyone including children, teachers, engineers or a retired accountant. They are the places for information seekers to search and retrieve information. Besides, libraries can also be a place for entertainment and relaxing reading. In Malaysia, every state has libraries and information centers. Almost every district in Malaysia has at least a library and even schools have their own libraries.

Locating and finding information about a library or information center can be a problem as not all libraries or information centers' information is published. To solve this problem, Dyflicia is proposed. Basically, Dyflicia or the Directory of Library and Information Centers in Malaysia is a web-based system for organizing, maintaining and retrieving of library and information centers' information in Malaysia. Below are the definitions of terms used.

Web-based

A web-based system is basically an online system where users can access it anywhere via an Internet browser through an Internet connection. It means, Dyflicia can be accessed anywhere around the world as long as there is an Internet connection.

Directory

A directory is an organizational unit used to organize items into a hierarchical. It contains bookkeeping information about the items in the hierarchical. In Dyflicia, a unit in the directory represents a library or an information center's information.

Library

A place in which literary and artistic materials, such as books, periodicals, newspapers, pamphlets, prints, records, and tapes, are kept for reading, reference, or lending. Dyflicia is a system that will help users to identify and locate a library.

Information Center

Place where information is organized by information professionals. It aims to help people to search and retrieve information. Dyflicia is a system that will help users to identify and locate a library.

1.2 Project Objective

This project is aimed to develop the Directory of Library and Information Center in Malaysia (Dyflicia) which is a web-based directory system. Dyflicia can be used to organize and retrieve the information and details about libraries and information centers in Malaysia. Therefore, it will also become a centralized storage for libraries and information centers' information in Malaysia.

For information retrieval, Dyflicia can be accessed via an Internet browser anytime and anywhere as long as there is an Internet connection. Users can browse through the directory and also perform a search to save their time.

To organize the information, an administrator subsystem and person-in-charge (Director) subsystem will be developed to maintain and monitoring Dyflicia's processes and activities. The administrators will maintain the system while the director will register his or hers institution information and update it when necessary. This is important to make sure the information provided is relevant and up-to-date. Therefore, there will be a database system to keep all the records and a login subsystem for the administration.

To provide a centralized storage, Dyflicia will be developed as an online database system. That means a database will be used to store all the information about libraries and information centers.

1.3 Target Users

Dyflicia is targeted at:

- Any online users who want to find a library or information centers since library and information center is used by almost everyone.
- Person-in-Charge (director) of a library or information center to register his or hers institution
- Administrator who will maintain the Dyflicia's system.

1.4 Project Scope

Basically, there will be three types of Dyflicia's users. They are the public users, member and the administrator. The users are the people who will be using the system and the administrator who will maintain the system. The membership is only open to person-in-charge or the director of a library or information center who will register and maintain their own institution's information.

1.5 Project Limitations

There are some limitations of Dyflicia. These limitations are caused by the scope and the security consideration of Dyflicia.

a. **Information Provided**

   a. **Only the following types of library and information center are provided:**

      1. National Library of Malaysia
      2. Academic – University and Colleges (Exclude Secondary and Primary School)
      3. Public/State
      4. Special Libraries – Government and Non-Government

   b. **Only the following information of a library or information centers are provided.**

      1. Name
      2. Type
      3. Description
      4. URL
      5. Picture
      6. Address
      7. City/Town
      8. State
      9. Person-In-Charge
      10. Contact Number

11. Opening Hours

12. Open To (example: Public, member, staff)

13. Collection Size (Printed)

14. Catalogue Form (example: Card)

15. Catalogue Type (example: Author/Title; Subject)

16. Catalogue Code (example: AACR II)

17. Classification Scheme (example: Dewey Decimal)

18. Services Provided (example: Lending, current awareness)

19. Special Programme (example: English Class)

20. Special Equipment (example: OHP)

b. Maintenance and Security

Only the administrators and member can modify the records in the database. Users cannot modify anything as this might result in unwanted changes to the database records.

c. Language Used

Dyflicia will be using English as the medium and it does not support multi-language. Implementation of Malay and Mandarin will be considered as the future enhancement.

1.6 Project Schedule

Figure 1 – Gantt Chart for Dyflicia

1.7 Expected Outcome

It is expected to provide a web-based system to organize, retrieve and store information on libraries and information centers in Malaysia. The system must provide an easy to use and user-friendly interface. It also must have sufficient input validation and error-traps. Besides, Dyflicia must also be easy to maintain when it is needed.

1.8 Report Layout

Chapter 1: Introduction

Include the Project Definitions, Project Objectives, Project Scopes, Project Limitations, Project Schedule and Project Layout.

Chapter 2: Literature Overview

This chapter will discuss the research area and the technical requirements of this project.

Chapter 3 : Methodology

This chapter will discuss the research and development strategies.

Chapter 4 : System Analysis

This chapter will include the system's functional and non-functional requirements. Hardware and software requirements will also be discussed here.

Chapter 5: System Design

Design Issues in building the projects such as system hierarchy, flow chart of system, sample user interface design and database design will be discussed here.

Chapter 6: System Implementation

Dyflicia's modules development and implementation will be discussed in this chapter.

Chapter 7: System Testing

This chapter discuss the testing performed on Dyflicia and the its result.

Chapter 8: System Evaluation and Conclusion

This chapter includes the summary of Dyflicia's strength and weakness, problem encountered during its life cycle and future enhancement if given more time. Basically it is about the conclusion of whole theses.

Chapter 2: Literature Review

2.1 Role of Literature Overview

The main role of literature review is to place the project in the context of others, which might have similar characteristics. It helps the developer to know some of the existing features in the similar system. Besides, it helps the developer to identify the strengths and limitations of several similar systems. This is the real challenge before making a final system decision to start developing the system. All gathered information from literature review can help the developer to choose the best way and methods to develop the system. In other words, researches on existing systems have to be done to build a good system. Information gathered will equip the developer with the knowledge that is important and essential in the planning, analysis, design and implementation of the system.

2.2 Approaches to Literature Review

To conduct the research for the project, three techniques have been used. These techniques are:

a) Analysis of Existing System

b) Internet

c) Reading Materials

2.2.1 Analysis of Existing System

In this method, five web-based directories of libraries is chosen and evaluated. Their functionality, user interface, strength and weakness are analyzed

2.2.1.1 Libweb - Library WWW Servers

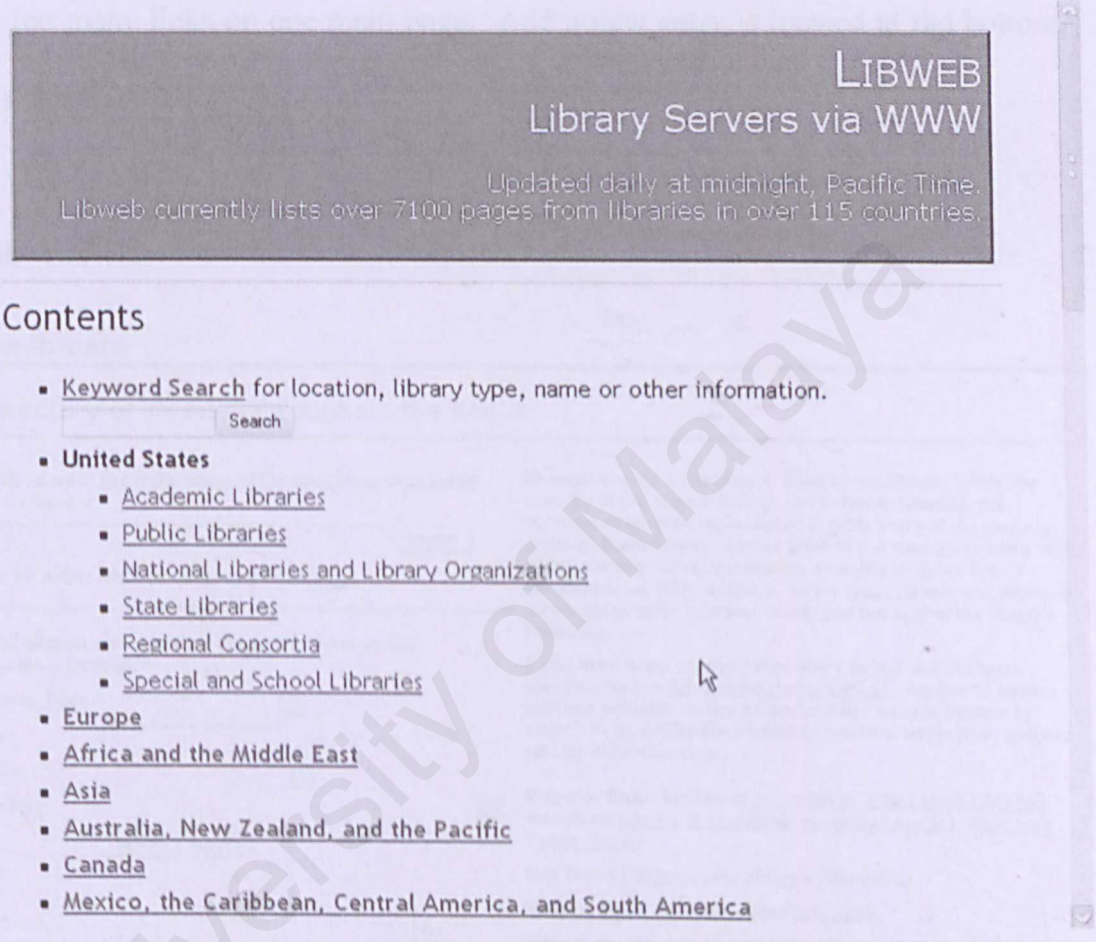

Figure 2.1 LibWeb Main Page

a) URL: http://sunsite.berkeley.edu/Libweb/

b) Introduction

This site allows search for search location, library type, name or other information. The list is organized into zones such as Europe, Africa, Middle East and Asia for example. There are links to other library related sites on the first page.

c) Strength

Lots of list of library – over 7100 pages

d) Weakness

Only the links are provided, no further information on the library. No so user friendly as there are too many links on one main page. Add a new entry is located at the bottom, user nay not realize it.

2.2.1.2 lib-web-cats

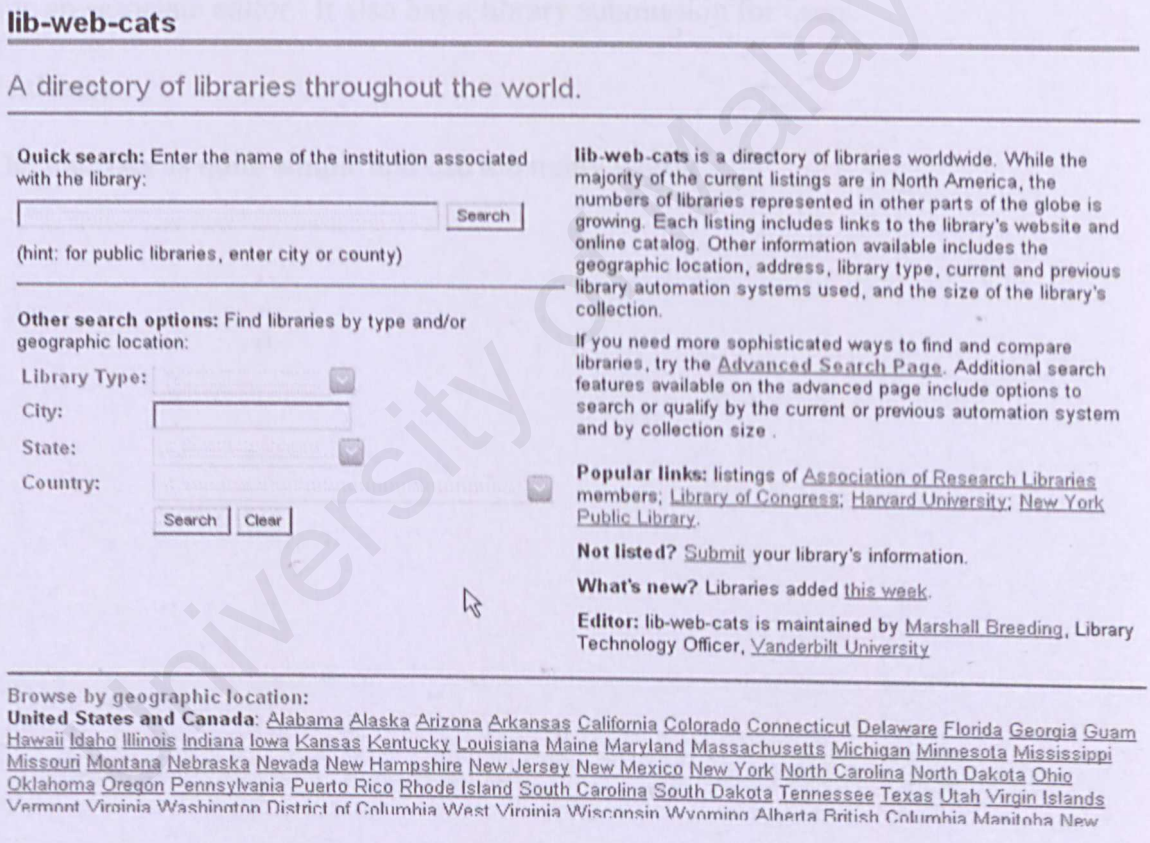

Figure 2.2 Lib-Web-Cats Main Page

a) URL: http://www.librarytechnology.org/libwebcats/

b) Introduction

This site is similar to Libweb - Library WWW Servers. The majority of the current listings are in North America while the numbers of libraries represented in other

parts of the globe is growing. Each listing includes links to the library's website and online catalog. Other information available includes the geographic location, address, library type, current and previous library automation systems used, and the size of the library's collection.

c) Strength

It has advanced search which include searching for collection size and show ASP sites only for example. The library information includes many details. Besides, this web has interaction with the users. It allows user to give comment or volunteer to become an associate editor. It also has a library submission for users.

d) Weakness

The interface is quite simple and use too many words.

2.2.1.3 Libdex

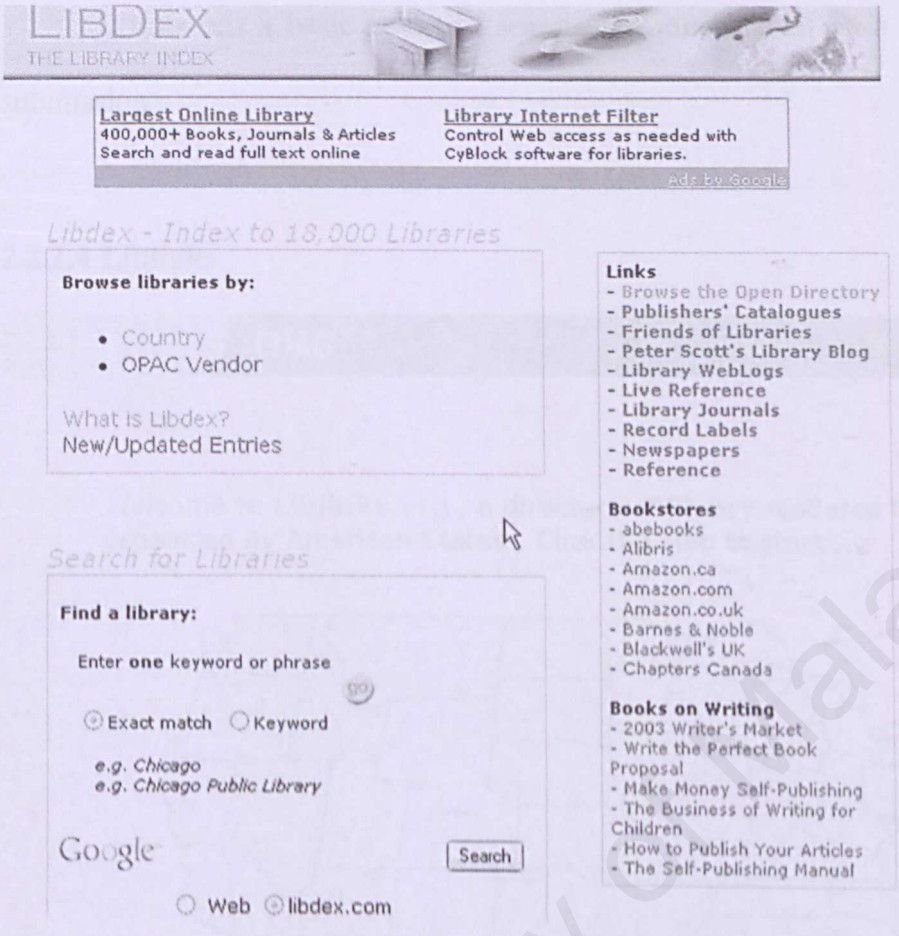

Figure 2.3 Libdex Main Page

a) URL: http://www.libdex.com/

b) Introduction

Libdex is a worldwide directory of library homepages, web-based OPACs, Friends of the Library pages, and library e-commerce affiliate links. The directory can be browsed using country or OPAC vendors.

c) Strength

It has a large collection of library, over 18,000 lists.

d) Weakness

It only has a basic keyword search, not much detail on a library and no users submission.

2.2.1.4 Liblinks

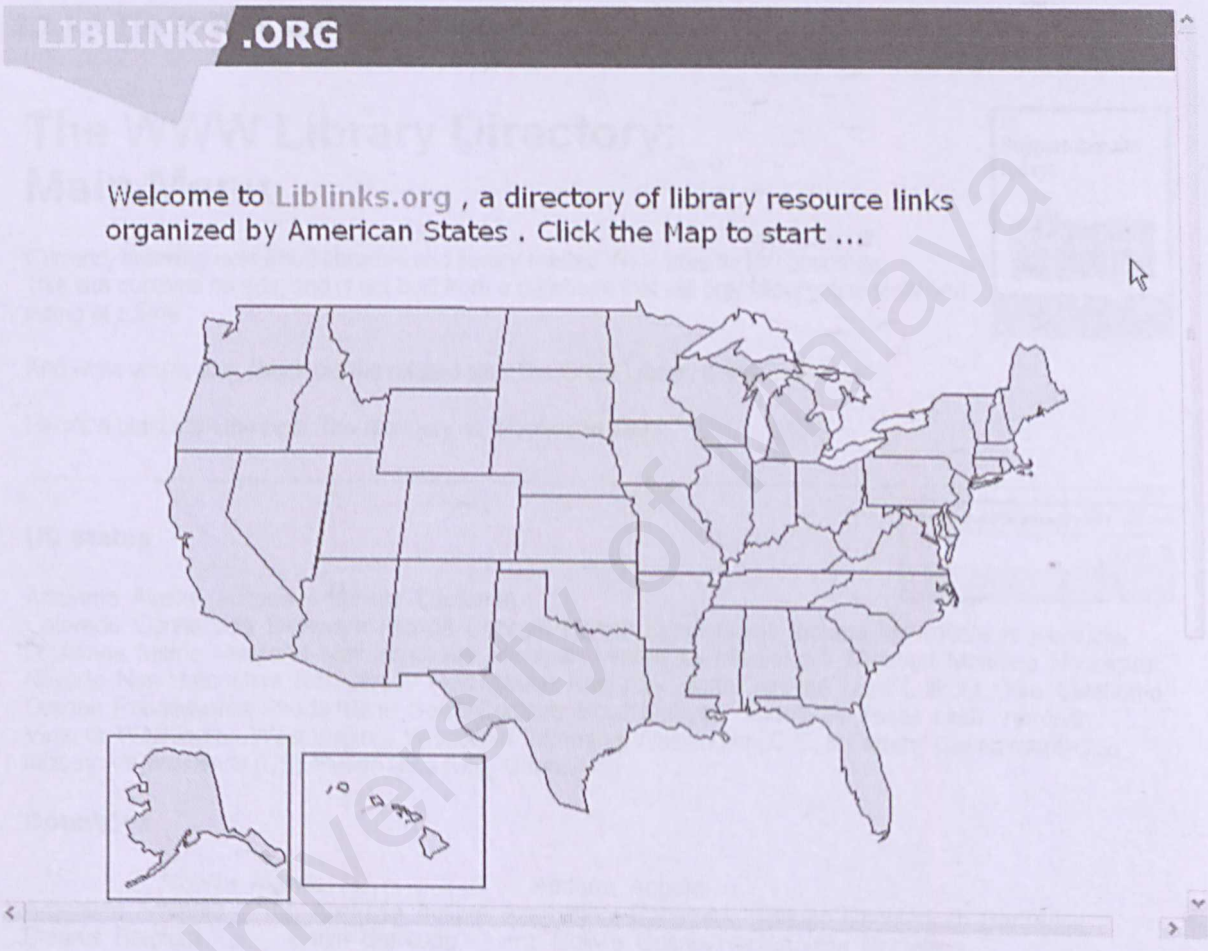

Figure 2.4 Liblinks Main Page

a) URL: http://www.liblinks.org/

b) Introduction

A simple directory of library resource links organized by American States.

c) Strength:

Large collection of library source in American States.

d) Weakness

Library list only available in American States, less detail on library and no user's submission. Only library's name, links and description are available.

2.2.1.5 The WWW Library Directory:

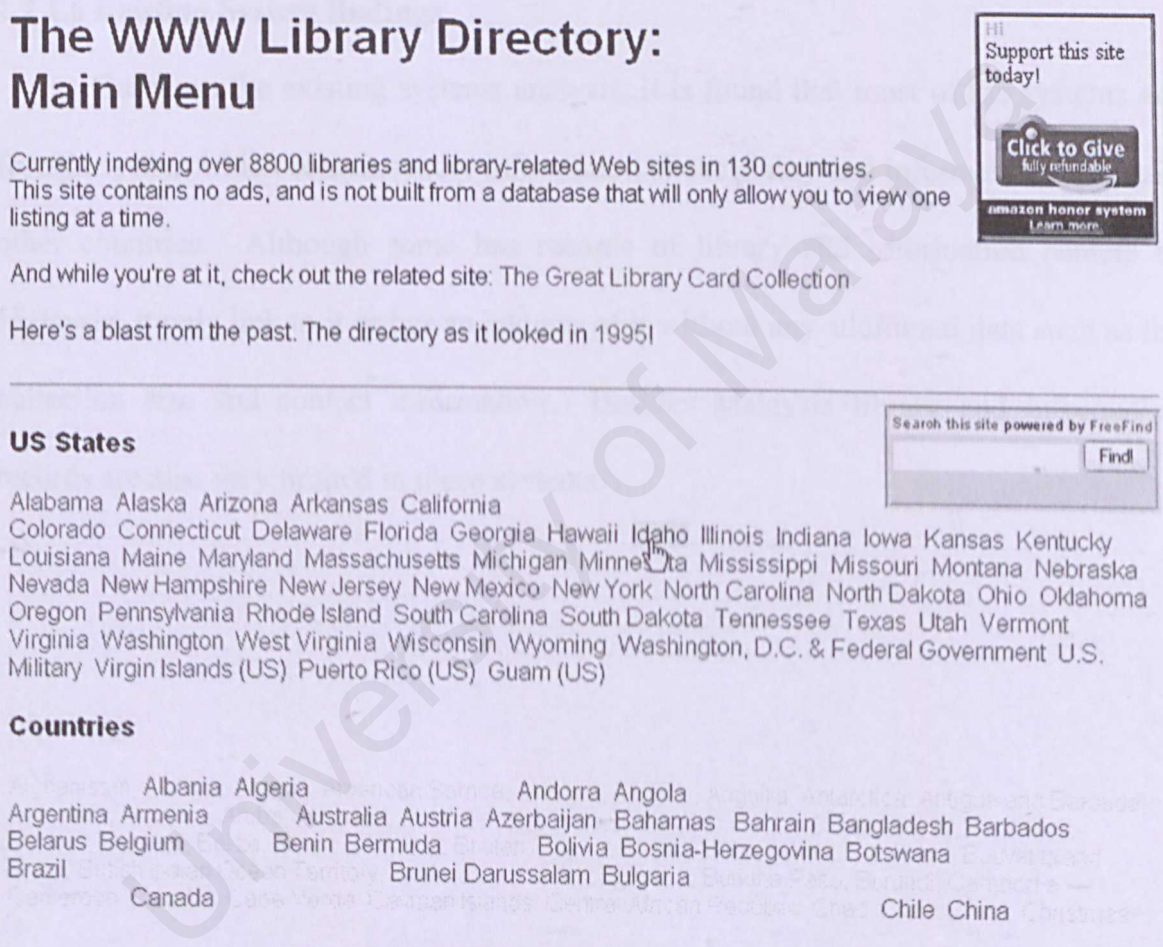

Figure 2.5 WWW Library Directory Main Menu

a) URL: http://www.webpan.com/msauers/libdir/

b) Introduction:

Currently indexing over 8800 libraries and library-related Web sites in 130 countries

c) Strength:

It has large collection and support online-submission.

d) Weakness:

Use third-party searching service, the service might go down. It has a basic user interface. Only library's name and links are available.

2.2.1.6 Existing System findings

Based on the existing systems analysis, it is found that most of the systems are foreign system which contains more information about library and information centers in other countries. Although some has records of library and information centers in Malaysia, it only link to it or has an address of it without any additional data such as the collection size and contact information. Besides Malaysia library and information records are also very limited in these systems.

2.2.1.6.1 Comparison of Current System with Dyflicia

Browse : Can user browse through the records?
Search : Can user search the records?
Submit Record : Can users submit the record?
Navigation : The links or buttons for users to go from page to page
Information Provided : The information of library and information centers.
User Interface : The design of the page
Communication : The level of communication between the user and user or the system owner

Table 2.1Comparison of Current System with Dyflicia

	Libweb	**lib-web-cats**	**Libdex**	**Liblinks**	**The WWW Library Directory**	***Dyflicia***
Browse	By region	By region	By Country	By US States	Yes	By State, Town/City and Type
Search	By Keyword.	Search by fields	By keyword	No	Yes Use third party search function	Keyword search and field search
Submit Record	Yes	Yes	Yes	No	Yes	Yes.
Information Provided	Name. URL, Location	Name Type URL, Address	Name Type, URL	Name, Description, URL	Name, URL	For a complete list, please refer to Chapter 4: System Analysis (Functional Requirement Analysis)
Navigation	Links are scattered	Links are scattered	Links to other sections are provided at the bottom of the page	Only a link to the first page from every others page	Links are scattered in a page	Navigation is provided at the top of the page.
User Interface	Simple, Minimal Use of graphic.	Simple, Minimal use of graphic. Too much words in a page	Simple, minimal use of graphic.	Simple, very minimal use of graphic	Simple and very minimal use of graphic	Interface will be designed with some graphics and user interface rules will be followed
Communication	None	Links To the system maintainer.	Email	No	Email	Feedback and Email

2.2.2 Internet

Nowadays, Internet has become a very popular place for people to search and gather information. The Internet provides the expertise information needed for developing the system. For example, information about software and hardware can be found from lots of web pages. This can be use as guidelines in determining the system requirements such as web development technologies and types of web servers. Besides, the online forum is a great source of information from various users. Current information such as the web programming language and web site design can be gathered from an online computer forum such like Neowin.net

2.2.3 Reading Materials - Books, Newspapers and Magazines

As for books, newspapers and magazines, a lot of information on computer software and hardware can be found. For example, the books on web programming language are identified to help the developer in choosing a language which is more suitable to use based on the developer's knowledge and experiences. From the newspapers and magazines, developer can learn the current trend of the web technologies. These newspapers and magazines include Computimes, PC.Com, PC Plus, CHIP Malaysia and PC Magazine.

2.3 System Development Technologies

Below are the complied list of the information on various kind of development technologies gathered from Internet, books and other reading materials.

2.3.3.1 Comparison of Web-Based Development Technologies

Below are three latest web-based development technologies that can be used to develop Dyflicia.

a. ASP.NET

ASP.NET is a technology for creating dynamic Web applications. It is part of the .NET Framework; developer can author ASP.NET applications in any .NET compatible language, including Visual Basic .NET, C#, and JScript .NET. ASP.NET pages (Web Forms) are compiled, providing better performance than with scripting languages. Web Forms allow developer to build powerful forms-based Web pages. When building these pages, developer can use ASP.NET server controls to create common UI elements, and program them for common tasks. These controls allow developer to rapidly build a Web Form out of reusable built-in or custom components, simplifying the code of a page. ASP.NET provides a programming model, and infrastructure, to make creating scalable, secure and stable applications faster, and easier than with previous Web technologies.

b. PHP

PHP is mainly focused on server-side scripting, so developer can do anything any other CGI program can do, such as collect form data, generate dynamic page content, or send and receive cookies. But PHP can do much more.

PHP can be used on all major operating systems, including Linux, many Unix variants (including HP-UX, Solaris and OpenBSD), Microsoft Windows, Mac OS X, RISC OS, and probably others. PHP has also support for most of the web servers today. This includes Apache, Microsoft Internet Information Server, Personal Web Server,

Netscape and iPlanet servers, Oreilly Website Pro server, Caudium, Xitami, OmniHTTPd, and many others. For the majority of the servers PHP has a module, for the others supporting the CGI standard, PHP can work as a CGI processor.

c. JSP

JavaServer Pages (JSP) technology enables Web developers and designers to rapidly develop and easily maintain, information-rich, dynamic Web pages that leverage existing business systems. As part of the Java technology family, JSP technology enables rapid development of Web-based applications that are platform independent. JSP technology separates the user interface from content generation, enabling designers to change the overall page layout without altering the underlying dynamic content.

JSP technology uses XML-like tags that encapsulate the logic that generates the content for the page. The application logic can reside in server-based resources (such as JavaBeans component architecture) that the page accesses with these tags. Any and all formatting (HTML or XML) tags are passed directly back to the response page. By separating the page logic from its design and display and supporting a reusable component-based design, JSP technology makes it faster and easier than ever to build Web-based applications.

Below are a summary of advantages and disadvantages ASP.NET, PHP and JSP.

Table 2.2 Comparison between ASP.NET, PHP and JSP

	Pro	Con
ASP.NET	Easier and faster to develop than ASP by using Microsoft Visual Studio.NET. Can use VB script as server-side scripting which is easy to learn by a beginner programmer. Works well with Microsoft SQL Server 2000.	Required IIS Web-Server which can only run on Windows-Based (NT and above) system with .NET framework installed.
PHP	Support cross-platform such as Linux, Unix and Microsoft Windows.	Some features do not work on Microsoft Windows and lacks of session handling.
JSP	Easy to maintain and has dynamic scripting	Produces useless error message, needs extra hard disk space and extra memory space.

2.3.3.2 Comparison of Scripting Language

This scripting is used as scripting in Dyflicia system needed to perform some programming, logics and confirmations.

a. JavaScript

JavaScript is a must in ASP.NET or other web development technologies to provide extra functionality. JavaScript is a scripting language from Netscape that is only marginally related to Java. Java and JavaScript is not the same thing. JavaScript was designed to resemble Java, which in turn looks a lot like C and C++. The difference is that Java was built as a general-purpose object language, while JavaScript is intended to provide a quicker and simpler language for enhancing Web pages and servers. JavaScript is embedded as a small program in a web page that is interpreted and executed by the Web client. The scripter controls the time and nature of the execution, and JavaScript functions can be called from within a Web document, often executed by mouse functions, buttons, or other actions from the user. JavaScript can be used to fully control Netscape and Microsoft Web browsers, including all the familiar browser attributes.

b. Visual Basic Script

Visual Basic Script is the most popular used language in ASP.NET development. Visual Basic Script is a scripting language developed by Microsoft. It is a fast, portable, lightweight interpreter for use in World Wide Web browsers and other applications that use Microsoft ActiveX Controls, Automation servers, and Java applets Source. It is a scaled down version of Visual Basic. While it doesn't offer the functionality of Visual

Basic, it does provide a powerful, easy to learn tool that can be used to add interaction to web pages.

2.3.3.2 Comparison of Integrated Environment Development Tool

Integrated Environment Development is software used to ease and boost the development speed.

a. Microsoft Visual Studio.NET 2003

Microsoft Visual Studio .NET 2003 is the comprehensive, multi-language development tool for rapidly building and integrating XML Web services and applications. Visual Studio .NET 2003 offers a highly productive environment in which to develop a broad range of Microsoft .NET connected applications and technologies. Using the high-performance Microsoft .NET Framework run-time environment, Visual Studio .NET provides developer with powerful tools for designing, building, testing, and deploying Web services and applications, as well as sharing best practices and guidelines in a team environment.

- The .NET Framework

The .NET Framework is a multi-language environment for building, deploying, and running XML Web services and applications. It consists of three main parts:

Common Language Runtime

Despite its name, the runtime actually has a role in both a component's runtime and development time experiences. While the component is running, the runtime is responsible for managing memory allocation, starting up and stopping

threads and processes, and enforcing security policy, as well as satisfying any dependencies that the component might have on other components. At development time, the runtime's role changes slightly; because it automates so much (for example, memory management), the runtime makes the developer's experience very simple, especially when compared to COM as it is today. In particular, features such as reflection dramatically reduce the amount of code a developer must write in order to turn business logic into a reusable component.

Unified programming classes

The framework provides developers with a unified, object-oriented, hierarchical, and extensible set of class libraries (APIs). Currently, C++ developers use the Microsoft Foundation Classes and Java developers use the Windows Foundation Classes. The framework unifies these disparate models and gives Visual Basic and JScript programmers' access to class libraries as well. By creating a common set of APIs across all programming languages, the common language runtime enables cross-language inheritance, error handling, and debugging. All programming languages, from JScript to C++, have similar access to the framework and developers are free to choose the language that they want to use.

ASP.NET

ASP.NET builds on the programming classes of the .NET Framework, providing a Web application model with a set of controls and infrastructure that make it simple to build ASP Web applications. ASP.NET includes a set of controls that encapsulate common HTML user interface elements, such as text boxes and drop-down menus. These controls run on the Web server, however, and push their user interface as HTML to the browser. On the server, the controls

expose an object-oriented programming model that brings the richness of object-oriented programming to the Web developer. ASP.NET also provides infrastructure services, such as session state management and process recycling that further reduce the amount of code a developer must write and increase application reliability. In addition, ASP.NET uses these same concepts to enable developers to deliver software as a service. Using XML Web services features, ASP.NET developers can write their business logic and use the ASP.NET infrastructure to deliver that service via SOAP.

b. Macromedia Dreamweaver

Macromedia Dreamweaver is the professional choice for building web sites and applications. It provide a solid foundation for widespread adoption of Cascading Style Sheets (CSS), Dreamweaver is not only the most sophisticated and extensible web design and development environment, it is also by far the most accessible and standards-friendly. Dreamweaver MX 2004 includes state of the art, standards-based design controls to ensure high-quality design. The entire design environment is built around CSS to enable fast, more efficient development of clean-coded, professional sites with sophisticated designs. Dynamic multi-browser validation automatically checks tags and CSS rules for design compatibility across leading browsers, the most common headache for developers. A built-in graphics editor using Macromedia Fireworks technology enables users to crop, resize, and edit graphics without leaving the Dreamweaver environment.

The open, technology-agnostic nature of Dreamweaver MX 2004 allows developers to work with their technologies of choice. Its platform-independent development environment supports all major server technologies, including Macromedia

ColdFusion, ASP.NET, JSP, and PHP. SecureFTP encrypts all file transfers and prevents unauthorized access to data, file contents, user names, and passwords. Seamless integration with Microsoft Word and Excel enables users to preserve formatting as CSS when cutting and pasting into Dreamweaver. The product also includes tighter integration with Macromedia Flash, Fireworks, and other design and development tools in Macromedia Studio MX 2004.

Below are the summary of Integrated Development Environment

Table 2.3 Comparison of IDE Tool.

	Pro	Con
Microsoft Visual Studio.NET 2003	User-friendly environment, structure editor in coding view, has WYSIWYG view, integrated smoothly with IIS 6 and SQL Server 2000	No able to build PHP and JSP page.
Macromedia Dreamweaver	Support for XHTML, XML, ASP, PHP, and SQL. Great CSS implementation.	Tons of features which will take long learning time

2.3.3.3 Comparison of Database Management System

One of the following database management systems will be used to store all the Dyflicia records.

a. Microsoft SQL Server 2000

Microsoft SQL Server 2000 is a database management system by Microsoft. It is benchmarked for scalability, speed, and performance. SQL Server 2000 is a fully enterprise-class database product, providing core support for Extensible Markup Language (XML) and Internet queries. Its security ensures applications are secure in any networked environment, with role-based security and file and network encryption. Its Simplified Database Administration allows automatic tuning and maintenance features that enable administrators to focus on other critical tasks. Besides, it is high in availability which can help to maximize the availability of business applications with log shipping, online backups, and failover clusters.

b. MySQL

This open source database management system includes all of the required enterprise features plus many innovations:

- Multiple storage engines including full transaction support with commit rollback, crash recovery and low-level locking capabilities. Developer can select from a range of storage engines from fast in-memory operation to full transaction support and clustering for high-availability.
- Query caching delivers significant performance benefits and with database replication, many slave servers can run off a single master server increasing both speed and robustness.

- A robust security system with advanced permissions and support for SSL transport-layer encryption provides robust application security.
- Full text indexing and searching enables rapid searching of text fields for words and phrases. This includes relevance rankings, exact phrase matching and Boolean search operators.

Below are summary of database management systems comparison.

Table 2.4 Comparison of Database Management System

	Pro	Con
Microsoft SQL Server 2000	Support large amount of con-current users. Powerful database management system. Work well with ASP.NET	Expensive and some advanced functions need more learning and exploration.
MySQL	Open source and multiplatform.	Inexperienced users might have some difficulties in using mySQL.

2.3.3.4 Comparison of Web-Server

Web-server is needed to execute server-side script and run the dynamic page.

a. Internet Information Services

Internet Information Services (IIS) is a powerful Web server, which provides a highly reliable, manageable, scalable, and secure Web application infrastructure. IIS enables organizations of all sizes to quickly and easily deploy Web sites and provides a high-performance platform for applications built using Microsoft ASP.NET and the Microsoft .NET Framework.

b. Apache Web-Server

The Apache server is a powerful, flexible, HTTP/1.1 compliant web server. It implements the latest protocols, including HTTP/1.1 (RFC2616) and is highly configurable and extensible with third-party modules. Apache can be customized by writing 'modules' using the Apache module API. It provides full source code and comes with an unrestrictive license. Apache runs on Windows NT/9x, Netware 5.x and above, OS/2, and most versions of UNIX, as well as several other operating systems. It is actively being developed

Below are summary of web server comparison.

Table 2.5 Comparison of Web Server

	Pro	Con
Internet Information Services 5.1	Easy to setup as it comes with Microsoft Windows NT and above.	Can only run on Windows-based system.
Apache Web-Server	Open source and multiplatform. Support PHP.	Have to install and configure manually.

2.4 Summary

Based on developer's experiences in using Microsoft Windows and programming in Visual Basic before, ASP.NET and Microsoft SQL Server 2000 will be used to develop Dyflicia with Microsoft Visual Studio.NET 2003. Dyflicia will run on Internet Information Services 5.1.

Chapter 3 System Methodology

3.1 Introduction to Methodology

A methodology can be defined as a systematic way of accomplishing certain tasks. The method can be grouped as a collection of procedures, techniques, tools and documentation aids. These methods help the software developer to speed up and simplify the software development process.

A methodology has four main objectives.

- To record the system requirements accurately.
- To monitor the progress of with a systematic method of development.
- To produces a system that is well documented and easy to maintain.
- To provides an indication of needed changes as early as possible in the development process.

3.2 Fact-Findings Techniques

To further understand and obtain what library and information centers users' needs and behavior, several identifying and retrieving methods have been chosen. This includes techniques such as Internet browsing and reading materials, questionnaire and study on current systems. All these information of requirements that are retrieved from the various sources are processed and analyzed. The output should give a precise picture on how the system should look like and perform.

3.2.1 Internet browsing and material reading

Internet or the "Information Superhighway" is a popular dynamic tool that researchers use to assists them in research work. This is because the Internet can provide access to a vast collection of information. Besides, reading material such as books, articles, magazines and newspaper are also an important source of information.

For example, to get definitions of the project, Internet search engines are utilized. Other information such as web technologies, database technology and other related aspects are gathered from the Internet. Books and other reading material are also used to further understanding on certain topics.

3.2.2 Observation and Current System Analysis

Analysis and observations of current existing system is done in order to understand and find out how Dyflicia will work and functions. Five of the existing websites are selected to do the analysis. Their strength and weakness are identified and analyzed.

The main criteria considered while analyzing a system includes the functionalities of the system such as search capabilities and the user interface design. These two aspects are very important for a webpage to attract users to visit the site. The interactions with users are also evaluated. For example, a user is allowed go give comments and even suggests a library or information center.

3.3 Development Methodology

The software-life-cycle model or development model which will be used to develop Dyflicia is the Waterfall Life-Cycle model. Below is a full waterfall life-cycle model diagram.

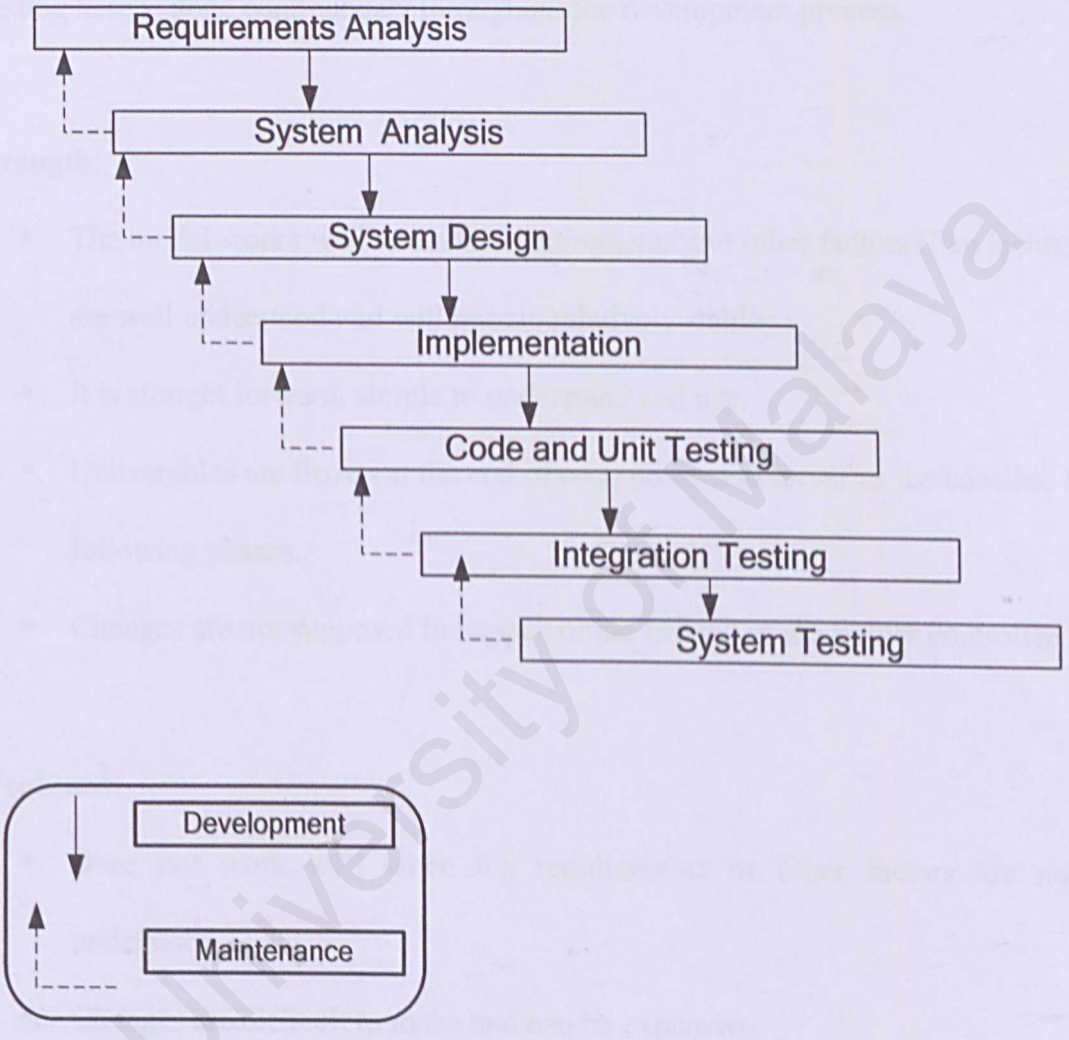

Figure 3.1 – Waterfall Model

Waterfall life-cycle is the grandfather of all other software lifecycles. The waterfall consists of a linear set of phases that progress one after the other. One of the critical point in waterfall model is that no phase is complete until the documentation for

that phase has been completed. If there is a modification to earlier phase as a consequence of a feedback loop, the earlier phase is complete only when the documentation for the phase has been modified and checked.

In waterfall model, testing is not a separate phase to be performed only after the product has been constructed, nor is it to be performed only at the end of each phase. Testing here is done continuously throughout the development process.

Strength:

- The model works well when the requirements and other factors (like technology) are well understood and will remain relatively stable
- It is straight forward, simple to understand and use.
- Deliverables are frozen at the end of each phase and server as the baseline for the following phases.
- Changes are not supposed to happen or are limited or are tightly controlled.

Weakness:

- Does not work well when the requirements or other factors are not well understood.
- Changes are difficult to make and can be expensive.
- Developer and users do not see the software until the end of the project.

Why choose waterfall?

Dyflicia is a small-scale system and its function is not more than to serve as a web-based system to provide and organize information. It is very unlikely that the requirement will change during system development. So, it is sufficient enough to use a simple and easy to use model instead of a complex model.

Chapter 4 System Analysis

4.1 Introduction to System Analysis

In order to produce the system requirements, system analysis must be done thoroughly. In this system analysis phase, various operations performed by the system and its relationships within and outside the system are studied. This is done by data gathering and analysis whereby the data will be gathered from various sources such as articles, Internet, interviews, survey and study on other existing similar systems.

In the system analysis, the system's functions, constraints and goals are defined in a manner that is understandable by both users and system developers. In this phase, the final outcome will be the accurate system requirement specification which will be referred to produce the system design specification. Basically, this phase is aimed to:

- To produce clear and understandable system functional and non-functional requirements for system designer and system users.

- To identify the software and hardware requirements for developing the system.

4.2 User Requirements

4.2.1 Functional Requirements Analysis

Public users – Any online users who will use Dylicia to retrieve information.

Member – Include person-in-charge (Director) of a Library or Information Center and System Administrators.

Module	Description
(I) Public Users Module	Users are the user who will use Dyflicia to search and retrieve information
a) Browse the Directory of Library or Information Center	Allow the users to browse the directory of library or information center. The library and information center can be browsed by choosing: **State** – The state where the institution is located **Institution type** – The institution type. The result can be filtered by: **Name** – Name of the institution **City/Town** – City or town where the institution is located.

b) Search a Library of Information Center	This sub-module is used by the users to search a library or information center. Users can fill in the following information to search **Keyword** – The keywords entered by Director or administrators to improve retrieval's accuracy **Name** – The name of the institution **Description** – The institution's description **Director** – The person-in-charge of the institution **Services** – The services provided by the institution **Programme** – The programme provided by the institution
c) Feedback	This sub-module is used by the users to give feedback on Dyflicia. Feedback form will request the user to key-in their - Name - Email address - Contact number - Comment/suggestion. The feedback will be reviewed by the

	administrator in the Feedback Management Module
(II) Member Module	
a) User Register	Allow the user to register as a member and register his or hers library or information center.
b) Member Login	Allow the member to login into Dyflicia to view his or hers institution registration status. They can also edit their institution details after login.
c) Member Logout	Allow the member to logout from Dyflicia. It is a link that present at every page within the member module.
d) Member Change Password	Allow the member to change their password
e) Member Edit Information	Allow the member to update their personal and institution information.
(III) Administrator Module	
a) Security	The module for security part in Administration Module
a.1) Administrator Login	This sub-module is used by the

	administrator to login into Dyflicia. If login is successfully, administrator will be presented the Administration Main Page.
a.2) Administrator Logout	This sub-module is used by the administrator to logout from Dyflicia. It is a link that present at every sub-module within the administration module.
a.3) Administrator Change Password	This sub-module is used by the administrator to change password. The changes will take affect on administrator's next login.
b) Library and Information Center Records Management	The module for managing the records of library and information center
b.1) View Library and Information Center Record	This sub-module is used by the administrator to view library and information center record.
b.2) Add Library and Information Center Record	This sub-module is used by the administrator to add library and information center record.
b.3) Edit Library and Information Center Record	This sub-module is used by the administrator to edit library and information center record.

b.4) Delete Library and Information Center Record	This sub-module is used by the administrator to delete library and information center record.
b.5) Search Library and Information Center Record	This sub-module is used by the administrator to search for library and information center record.
(C) Feedback Management	The module for managing the feedback from the users.
c.1) View Feedback	This sub-module is used by the administrator to view feedback
c.2) Search Feedback	This sub-module is used by the administrator to search feedback.
c.3 Change Feedback Status	To allow administrator to change status of the feedback. There are three status: - New :New Feedback - Critical :Required immediately attention - Viewed :Viewed and non-critical
(D) Member Management	The module for managing the member of Dyflicia. The members include person-in-charge and system administrators.
d.1) View member	This sub-module is used by the administrator to view all Dyflicia's

	member list.
d.2) Edit Member	To allow the Main Administrator (System Owner) to change the member type and edit their information. Member types include: **Director** – Only can edit his or hers institution information. **Lower Administrator** – Can access any administrator module EXCEPT Member Management module (E). **Main Administrator** – Has full access to the all Administrator's Module.
d.3) Delete member	This sub-module is used by the administrator to delete a Dyflicia's member.
d.4) Search member	This sub-module is used by the administrator to search a Dyflicia's member.

4.2.2 Non-Functional Requirement Analysis

i) User friendliness

User interface is a very important aspect in a web-based system as it is the communication medium between the user and the system. Dyflicia's interface must be consistent. In other words, all the controls (buttons, tables, dropdown list) must be same size for all pages. The colour used should be same for similar sub-modules. Besides, the user must be told where they are now and provide navigation for them to move to upper level. This is to prevent the users from getting lost.

ii) Correctness

A system is functionally correct if it behaves according to the specification of the functions it should provide (functional requirements specifications). To make sure Dyflicia has high rate of correctness, it will be tested thoroughly.

iii) Functionality

The most important and critical function in Dyflicia will be the searching, browsing and retrieving information on libraries and information centers. The testing on related modules to these functions will be emphasized.

iv) Reliability

The reliability of a system refers to the required precision of its function. To ensure reliability In Dyflicia, certain methods will be implemented. This includes input validation, friendly error-message and confirmation message.

v) Robustness

Robustness asks the question, "Does it behave reasonable when I misuse it?" The system which is high robustness behaves reasonable even in circumstances that

were not anticipated in the requirement specification. To make sure Dyflicia's robustness, user input is validated before it is sent to the server to be processed.

vi) Efficiency

Efficiency is equal to performance. Dyflicia must be developed to use available resource efficiently. This is important to make sure Dyflicia is fast in page generation and graphic loading.

vii) Maintainability

One of Dyflicia's goal is to provide a up-to-date information on libraries and information centers. To archive this, administration page is included to maintain the records of libraries and information centers. Besides, this page is used to manage other sub-module such as error report, suggestion and guestbook.

viii) Security

The main page for using Dyflicia is open to all public users. Users can browse the directory or search for information. The administration main page is totally hidden form the public users. It is accessed via a different link. Only a registered administrator can login into the administration main page and make changes which will affects the database.

ix) Reparability

High reparability allows defect correction with limited effort. System bugs and errors may be found during implementation o testing. To make sure of high reparability, developer must have an up-to-date documentation, easy to read coding and comments for the codes.

4.2.3 Technical Requirement Analysis

This part will discuss the chosen web-based development technology requirement, scripting language requirement, Integrated Development Environment requirement, database management system requirement, web server requirement and operating system requirement.

4.2.3.1 Web-based Development Technologies requirement– ASP.NET/HTML (Source: http://www.microsoft.com)

ASP.NET is chosen as the web-based development technology and work along with Hypertext Markup Language (HTML). HTML is the standard for presenting documents on the World Wide Web (WWW). It will be used for displaying page and integrate with ASP.NET which will provide scripting language to perform database function and programming logic. Below are some of the advantages of using ASP.NET.

Powerful database-driven functionality

Like ASP (Microsoft's language preceding ASP.Net), ASP.Net allows programmers to develop web applications that interface with a database. The advantage of ASP.Net is that it is object-oriented and has many programming tools that allow for faster development and more functionality.

Faster web applications

Two aspects of ASP.Net make it fast -- compiled code and caching. In the past, the code was interpreted into "machine language" when website visitor viewed the page. Now, with ASP.Net the code is compiled into "machine language" before the visitor ever comes to the site.

Caching is the storage of information that will be reused in a memory location for faster access in the future. ASP.Net allows programmers to set up pages or areas of pages that are commonly reused to be cached for a set period of time to improve the performance of web applications. In addition, ASP.Net allows the caching of data from a database so your website isn't slowed down by frequent visits to a database when the data doesn't change very often.

ASP.Net was tested and found to be over 10 times faster for the average user than Java's J2EE technology. While there have been some debates about the methods of the testing it is interesting to note that this has been validated by 3rd parties.

Memory leak and crash protection

ASP.Net automatically recovers from memory leaks and errors to make sure that the website is always available to the visitors.

Multiple language support

Programmers can actually write their code in more than 25 .Net languages (including VB.Net, C#, and JScript.Net). This allows programmers to develop the site in the language they know best.

4.2.3.2 Scripting Language Requirement (JavaScript and VB Script)

a) JavaScript

JavaScript is a must have user-side scripting language in ASP.NET development. It is cross-browser support, which means, it can run on different browsers. It can be used to validate data on the client. It can also be used to create more sophisticated user interfaces. JavaScript can also be used to add effects to the website. It is much faster to download than some other front-end technologies like Flash and Java applets.

b) Visual Basic Script

Visual Basic script is the most popular language in ASP.NET development. It is fast, portable and easy to use and learn. It is used to perform scripting and programming logic in ASP.NET pages.

4.2.3.3 Integrated Environment Development Tool - Microsoft Visual Studio.NET 2003 Enterprise Architect Edition VS.NET 2003)

(Source: http://www.microsoft.com)

Microsoft Visual Studio.NET 2003 is the best tool for developing ASP.NET applications. It integrated the most important tool needed for developing a web-based system such as editors and designers. The editor refers to the code editor. VS.NET has the code-behind function which divides the HTML and ASP.NET codes. It makes coding easier, faster and more efficiency.

For developing Dyflicia, VS.NET's Web Forms Designers will help to create What You See Is What You Get (WYSIWYG) ASP.NET Web Forms applications. It allows the developer to have a direct manipulation to the user's interface. The ability to drag and drop controls such as button and drop-down list reduce the coding and make development faster.

Another feature which makes VS.NET as the choice is the Command Window. It combines some of the best features of the Immediate Window from Visual Basic with the power of a command line. The Command Window has two modes of operation. In Command mode, the window acts as a command-line tool. In Immediate mode, the Command Window is used for debugging. In Immediate mode, we can execute statements, change variables and print their values, and evaluate expressions.

4.2.3.4 Database Management System – Microsoft SQL Server 2000 Personal Edition

(Source: http://www.microsoft.com)

Microsoft SQL Server 2000 is currently the most suitable database management system for developing data-driven ASP.NET system. Its query analyzer provide a great interface for querying the database and can be used to analyzing SQL Query from ASP.NET debugging session. Besides, its Enterprise Manager provides an easy to use and friendly interface to manage the database.

4.2.3.5 Web Server Requirement –Internet Information Services 5.1 (IIS 5.1)

(Source: http://www.microsoft.com)

IIS 5.1 comes with Microsoft XP Professional CD. It is the only web server that can run ASP.NET web pages. It is to install and configured as it has a friendly window-based user interface. Although it has some security issues, it is still not critical as Microsoft will release security patch if a security hole is detected. Moreover, Dyflicia is not a security-critical system.

4.2.3.6 Operating System Requirements (Microsoft Windows XP Professional)

(Source: http://www.microsoft.com)

Microsoft Windows XP Professional is chosen as it is the newest operating system that can run IIS 5.1 web server. It is built on NT system which is known for its stability.

4.2.4 Hardware Requirement

The hardware requirement for developing Dyflicia will be based on Microsoft Visual Studio.NET 2003 Enterprise Architect as it is the most resource hungry application.

Processor: PC with a Pentium II-class processor, 450 MHz

RAM:

Windows 2000 Professional — 96 MB

Windows 2000 Server — 192 MB

Windows XP Home — 96 MB

Windows XP Professional & Windows Server 2003 — 192 MB

Available Hard Disk Space:

900 MB on system drive, 4.1 GB installation drive

Operating System

Windows 2000, Windows XP, Windows Server 2003, or Windows NT 4.03,4,5

Chapter 5 System Design

5.1 Overview of System Design

After performing the system analysis and choosing of suitable development tools for the project, the next step is the system design of the project according to the waterfall methodology. System design is defined as those tasks that focus on the specification of a detailed computer-based solution. It is also called physical design. System design focuses on the technical or implementation concerns of the system while system analysis (the previous phase) emphasized the business problem.

There are many strategies for techniques for performing system design. The approaches that will be used here is the modern structured design. Structured design helps the developers to deal with the size and complexity of the system. It is a process-oriented technique for breaking up a large system into hierarchy of small modules to ease the implementation and maintenance.

System design for Dyflicia is composed of following parts:

- Structure Chart
- Application Architecture Design
    - Context Diagram
    - Data Flow Diagram
- System Database Design
- Database Diagram
- Database Dictionary
- System Interface Design

5.2 Structure Chart

Below is the structure chart for Dyflicia. The data flow is from top to down. Please refer to data flow diagram for a full flow of inputs, outputs, processes and data stores.

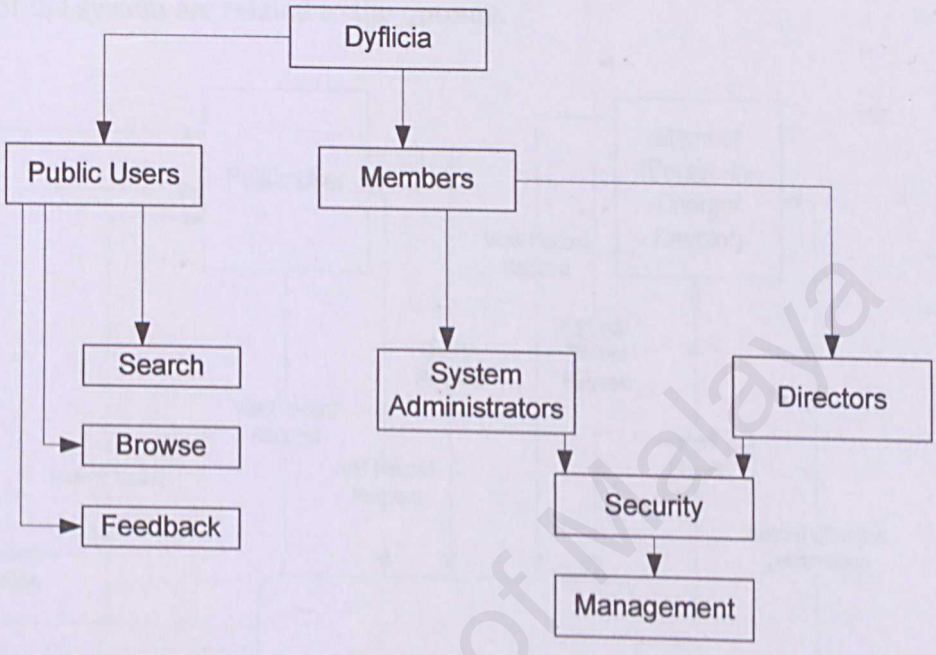

Figure 5.1 – Structure Chart

5.3 Application Architecture Design

Application architecture defines the system in terms of the data, processes, and interfaces and locations. This task is accomplished by analyzing the functional requirements of the system from system analysis. As the result, the context diagram and data flow diagram are produced.

5.3.1 Context Diagram

Context diagram identifies the interface of the system including the users using the system, the data from or to the system, and external systems that interface to the system. It identifies what data the system sends to and receives from the users, and how the inputs of the system are related to the outputs.

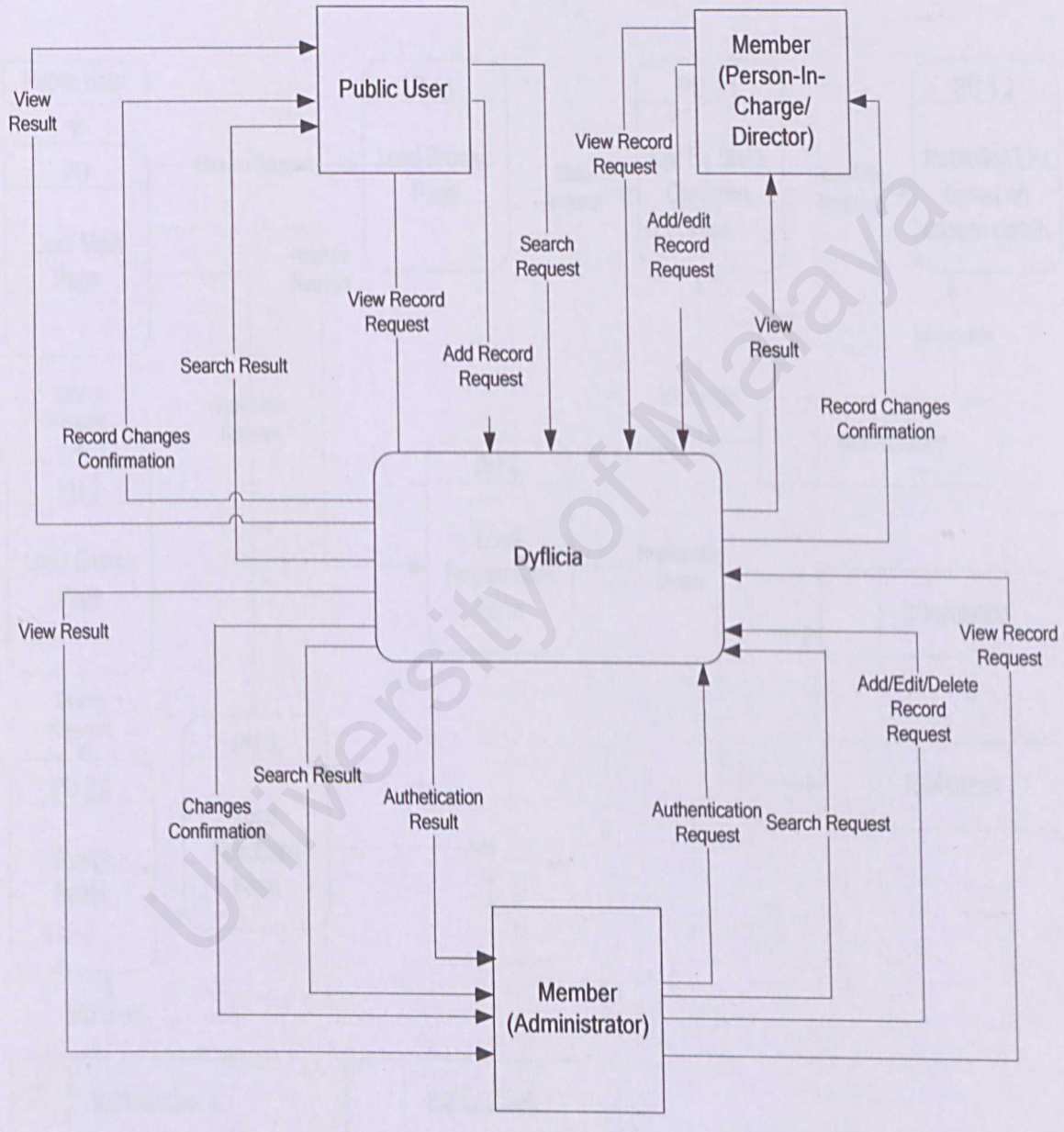

Figure 5.2 – Context Diagram

5.3.2 Data Flow Diagram

Data Flow Diagram (DFD) is used for depicting the decomposition of a system into a structure of activities (or processes) and their interfaces, together with the origins, destinations and stores of data. DFD's distinguish data, input, output, processes and the data flow itself.

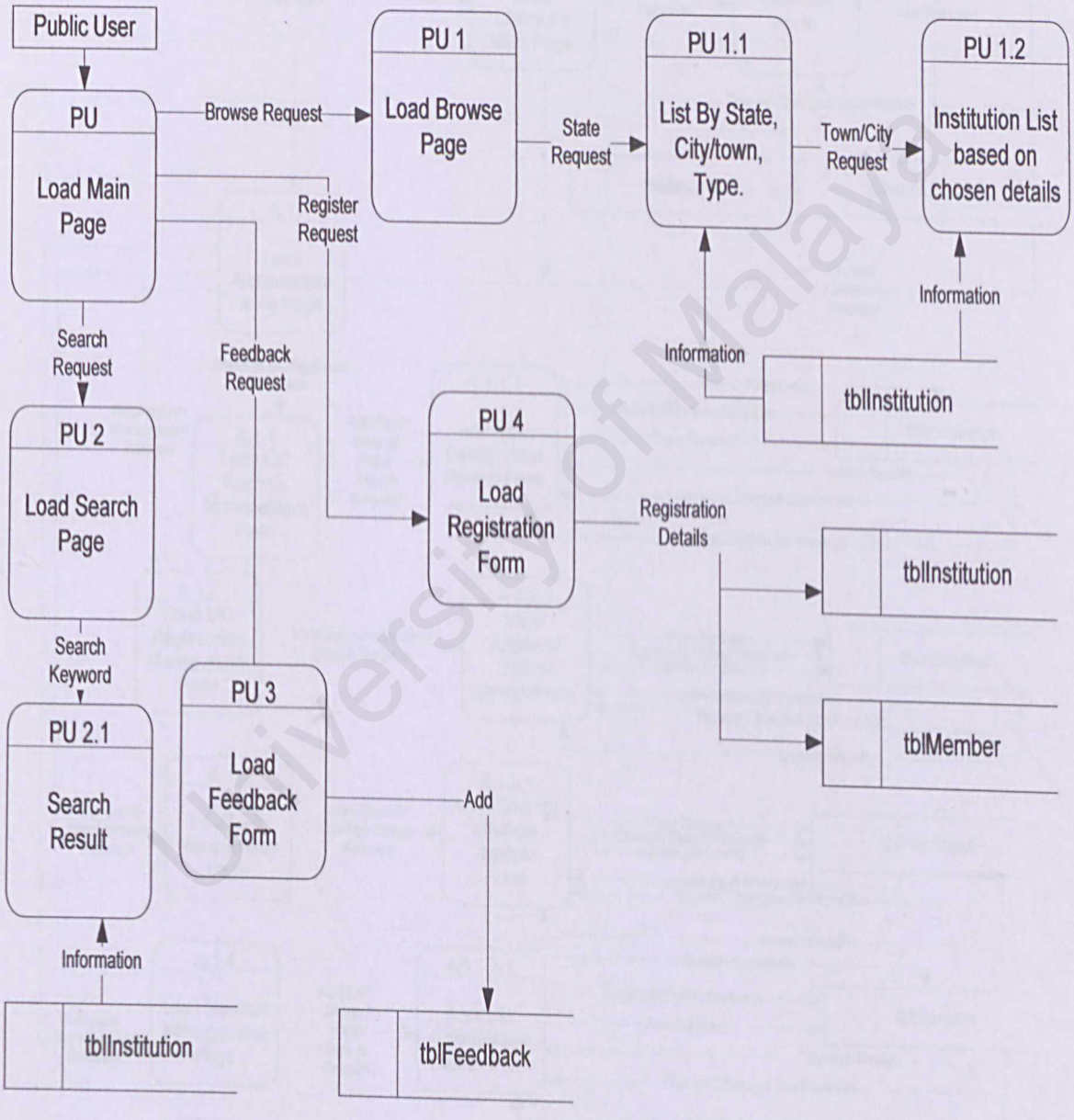

Figure 5.3 Public User Module's DFD

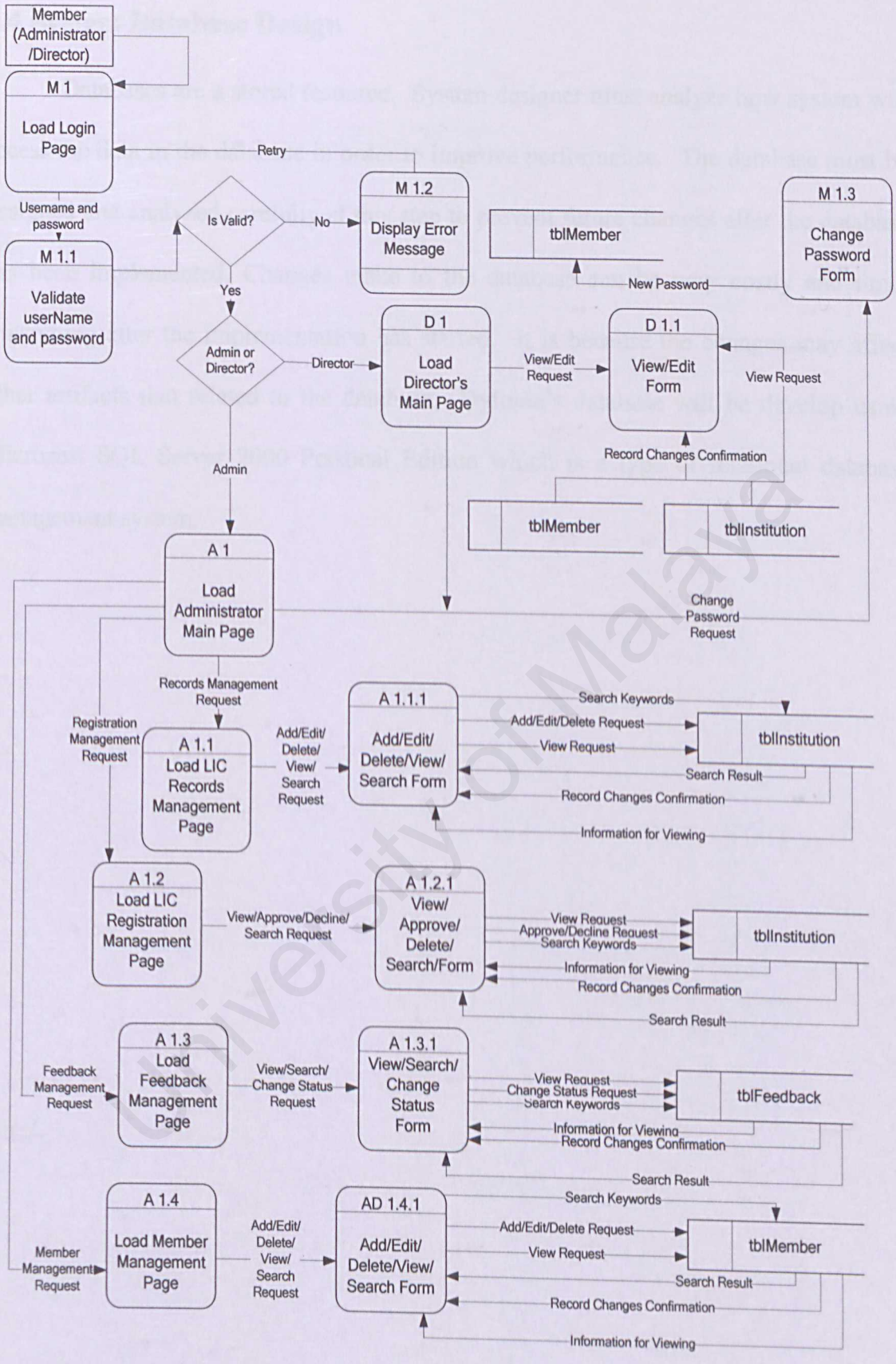

Figure 5.4 –Member Module's DFD

5.4 System Database Design

Databases are a stored resource. System designer must analyze how system will access the data in the database in order to improve performance. The database must be designed and analyzed carefully at this step to prevent future changes after the database has been implemented. Changes make to the database can be very costly and time-consuming after the implementation has started. It is because the changes may affect other artifacts that related to the database. Dyflicia's database will be develop using Microsoft SQL Server 2000 Personal Edition which is a type of relational database management system.

5.4.1 Database Diagram

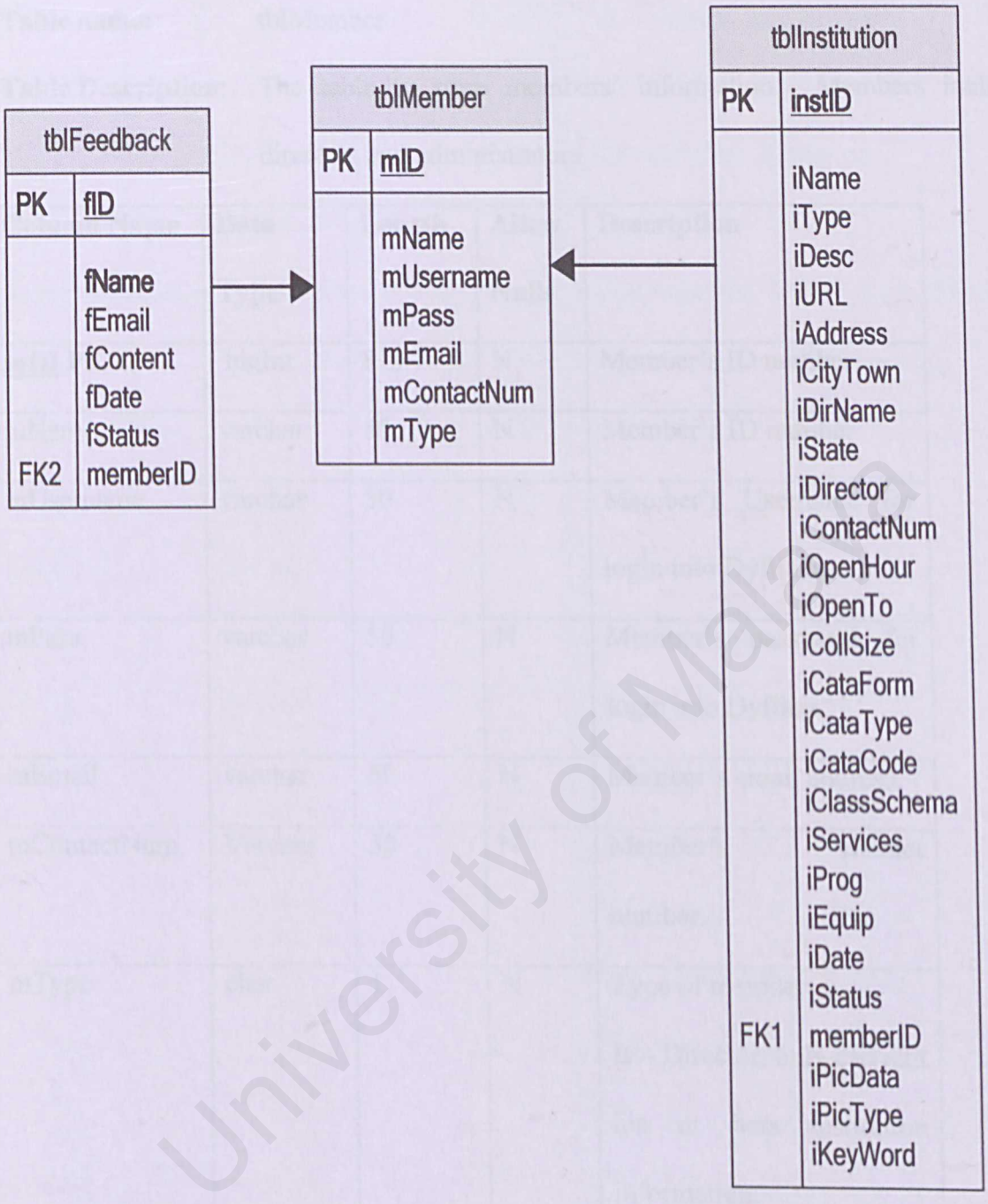

Figure 5.5 –Database Diagram

5.4.2 Database Dictionary

Table name: tblMember

Table Description: The table to store members' information. Members include directors and administrators

Column Name	Data Type	Length	Allow Nulls	Description
mID PK	bigInt	8	N	Member's ID number
mName	varchar	50	N	Member's ID number
mUsername	varchar	50	N	Member's Username for login into Dyflicia
mPass	varchar	50	N	Member's password for login into Dyflicia
mEmail	varchar	50	N	Member's email address.
mContactNum	Varchar	50	N	Member's contact number.
mType	char	1	N	Type of member: **D** – Director, only can edit his or hers institution information. **L** - Lower Administrator, can access any administrator module EXCEPT Member

				Management module. A - Main Administrator has full access to the all Administrator's Module.

Table name: tblInstitution

Table Description: The table to store libraries and information centers' information, including approved. new registration and declined records.

Column Name	Data Type	Length	Allow Nulls	Description
instID PK	bigInt	8	N	Institution's ID number
iName	varchar	100	N	Institution's Name
iType	Varchar	20	N	Institution's Type. - National Library of Malaysia - Academic (University and Colleges (Exclude Secondary and Primary School)) - Public/State - Special Libraries - Government and Non-Government
iDesc	varchar	500	Y	Institution's Description

iURL	varchar	500	Y	Institution's URL address
iAddress	varchar	500	Y	Institution's Address
iCityTown	varchar	50	Y	Institution's City or town
iState	varchar	50	Y	Institution's State
iDirector	Varchar	100	Y	Institution's director or person-in-charge
iContactNum	varbinary	50	Y	Institution's Contact's Number
iOpenHour	Varchar	500	Y	Institution's opening hours
iOpenTo	Varchar	500	Y	Institution's Open To (Public, Member, etc)
iCollSize	varchar	500	Y	Institution's Printed Collection Size
iCataForm	Varchar	100	Y	Catalogue Form (example: Card)
iCataType	Varchar	100	Y	Catalogue Type (example: Author/Title; Subject)
iCataCode	Varchar	100	Y	Catalogue Code (example: AACR II)
iClassSchema	Varchar	100	Y	Classification Scheme (example: Dewey Decimal)

iServices	varchar	100	Y	Services Provided (example: Lending, current awareness)
iProg	Varchar	500	Y	Special Programme (example: English Class)
iEquip	Varchar	500	Y	Special Equipment (example: OHP)
iDate	datetime	8	N	The date when the record is added or edited
iStatus	varchar	2	N	Status of the record. A – Approved P – Pending (Not Approved) D- Declined
memberID FK	bigInt	8	N	The member who added or the record
iPicData	image	16	Y	The binary data of institution's image
iPicType	nvarchar	100	Y	The image type of institution's image
iKeyWord	varchar	1000	Y	The keyword for improving search's accuracy

Table name: tblFeedback

Table Description: The table to store feedback's information

Column Name	Data Type	Length	Allow Nulls	Description
fID PK	bigInt	8	N	Feedback's ID number
fName	varchar	50	Y	The user's full name who submit the feedback
fEmail	varchar	50	Y	User's email who sent the feedback
fContent	varchar	500	N	The content for the feedback
fDate	datetime	8	N	The Date when the feedback is sent
fStatus	varchar	2	N	Status of the feedback. N – new C – Critical (require immediately

				attention. V – Viewed (Viewed and not critical) S – Solved
memberID FK	bigInt	8	Y	Administrator who view and changed the status of the feedback.

5.5 System Interface Design

Below are the screenshots of interfaces for important modules in Dyflicia.

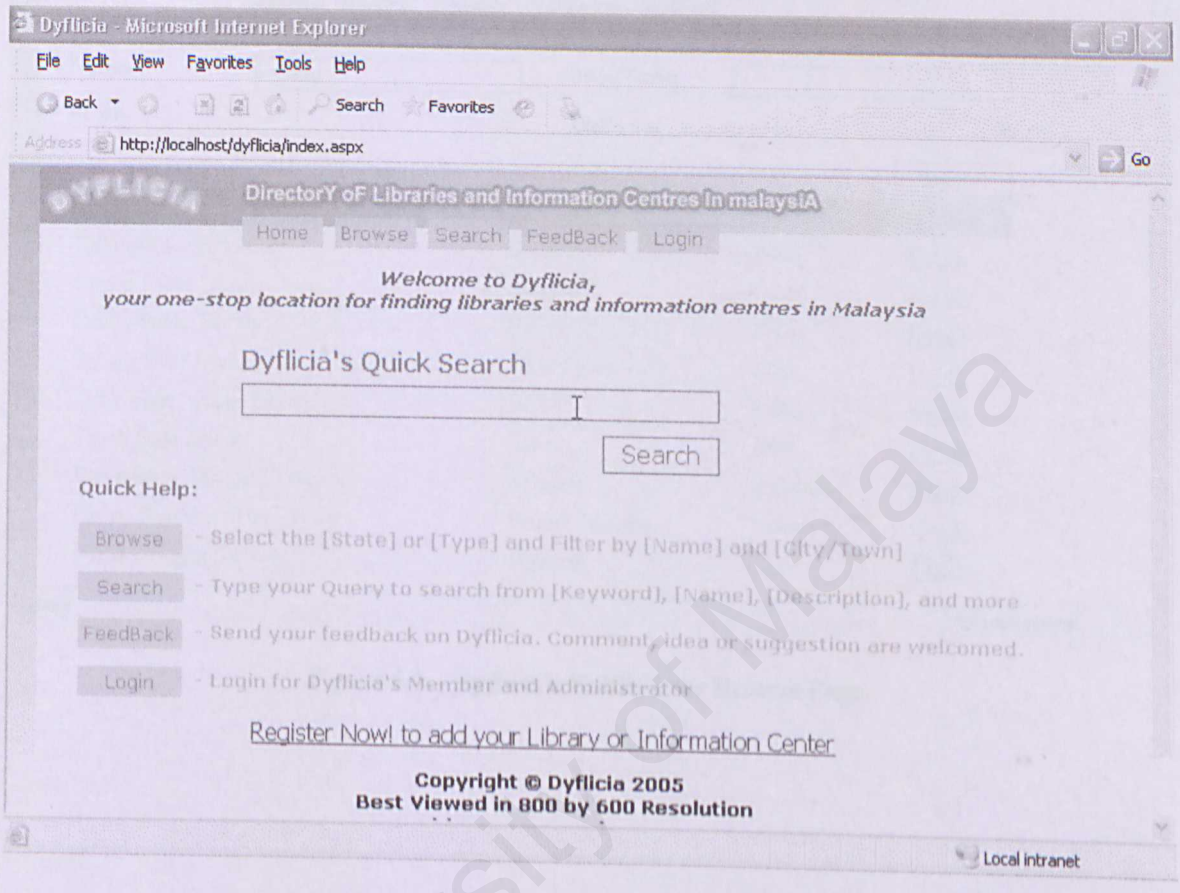

Figure 5.6 – Dyflicia's Public User Main Page.

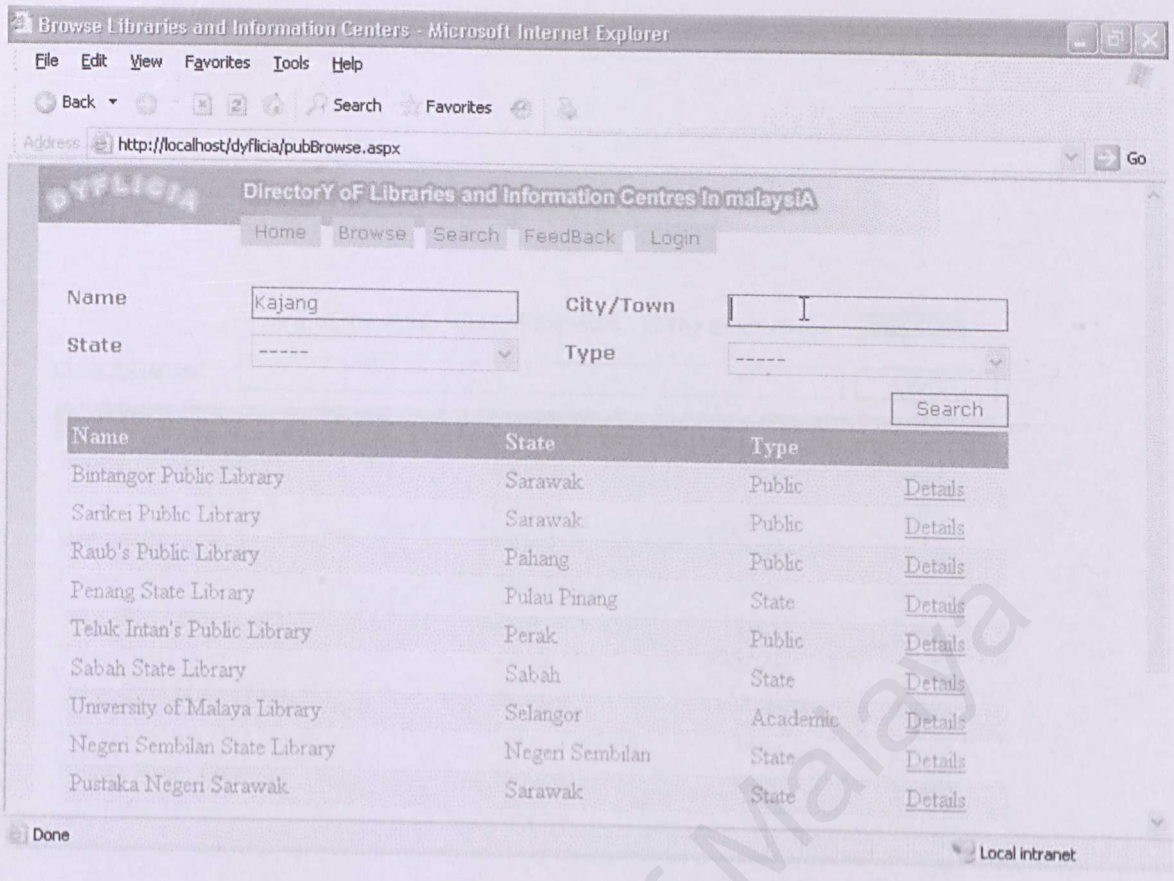

Figure 5.7 – Dyflicia's Public User Browse Page.

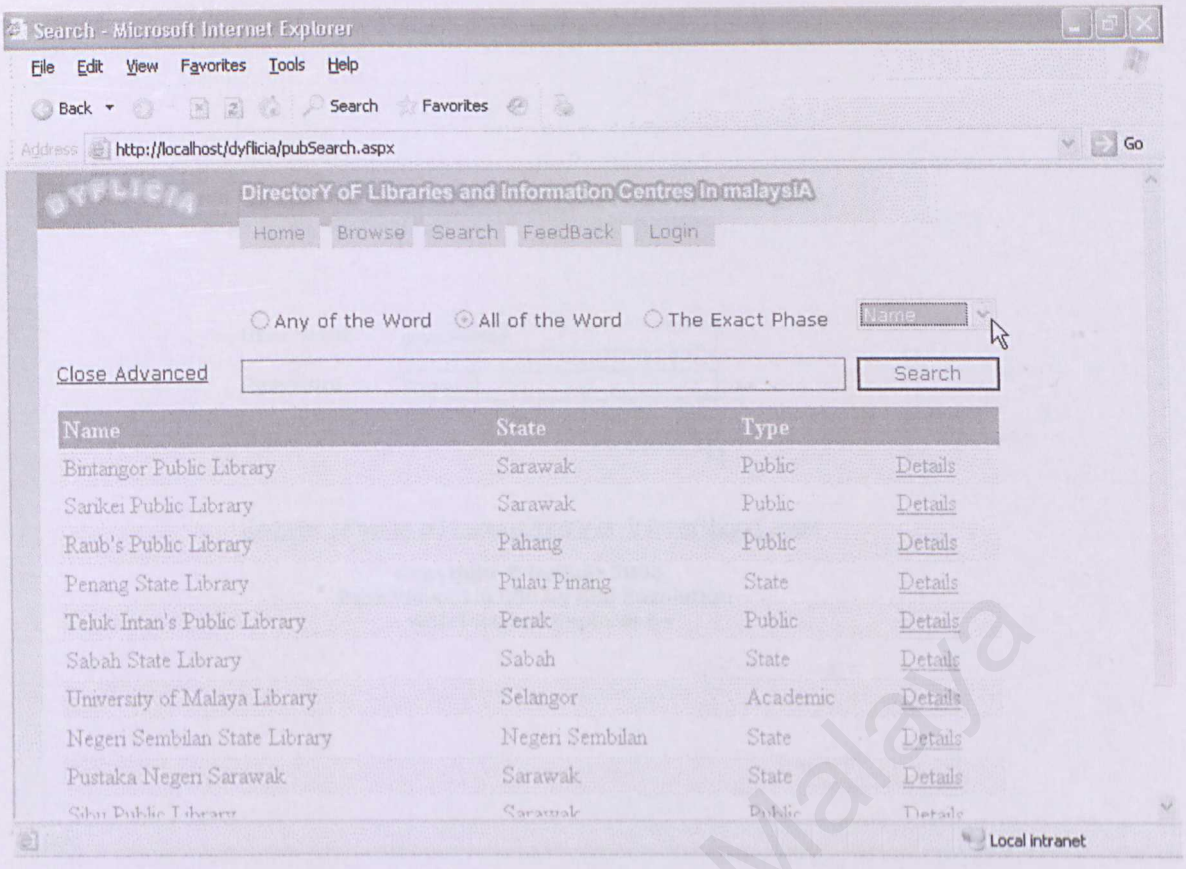

Figure 5.8 – Dyflicia's Public User's Search Page.

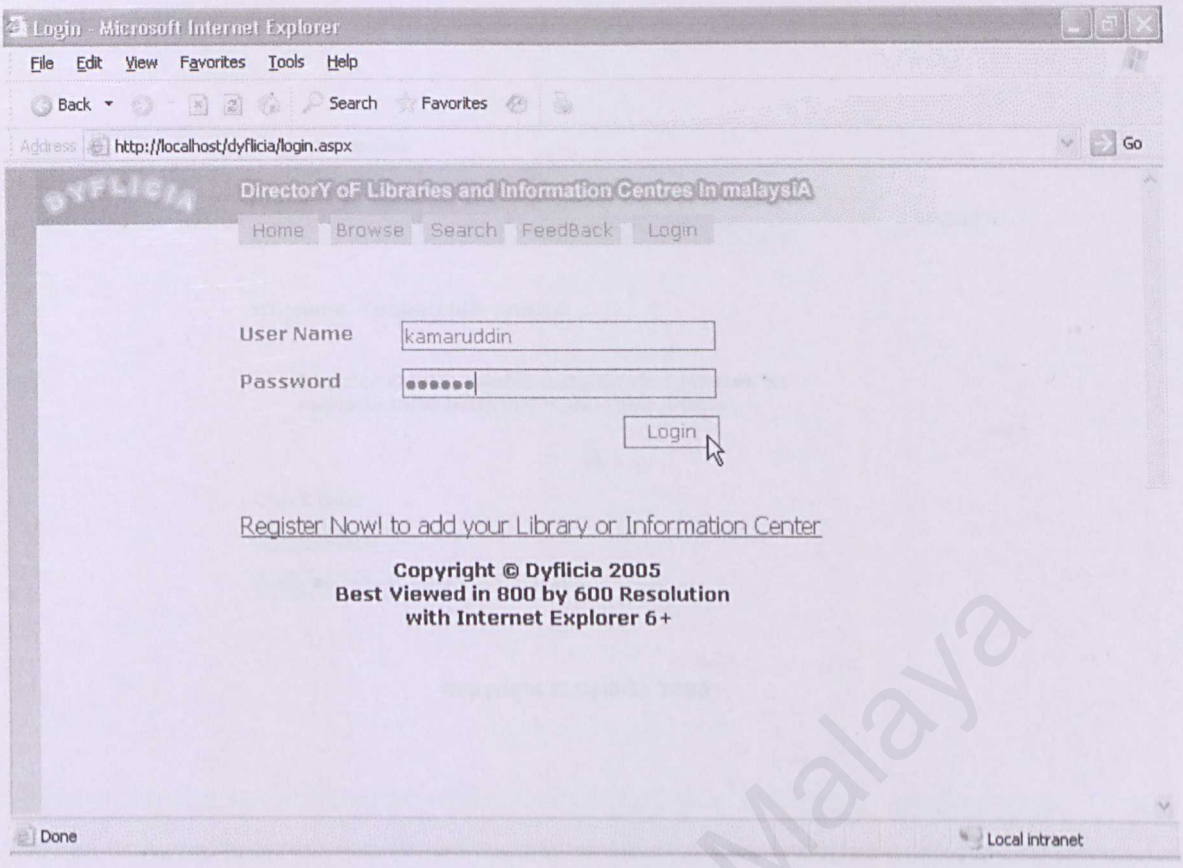

Figure 5.9 – Dyflicia's Member Login Page.

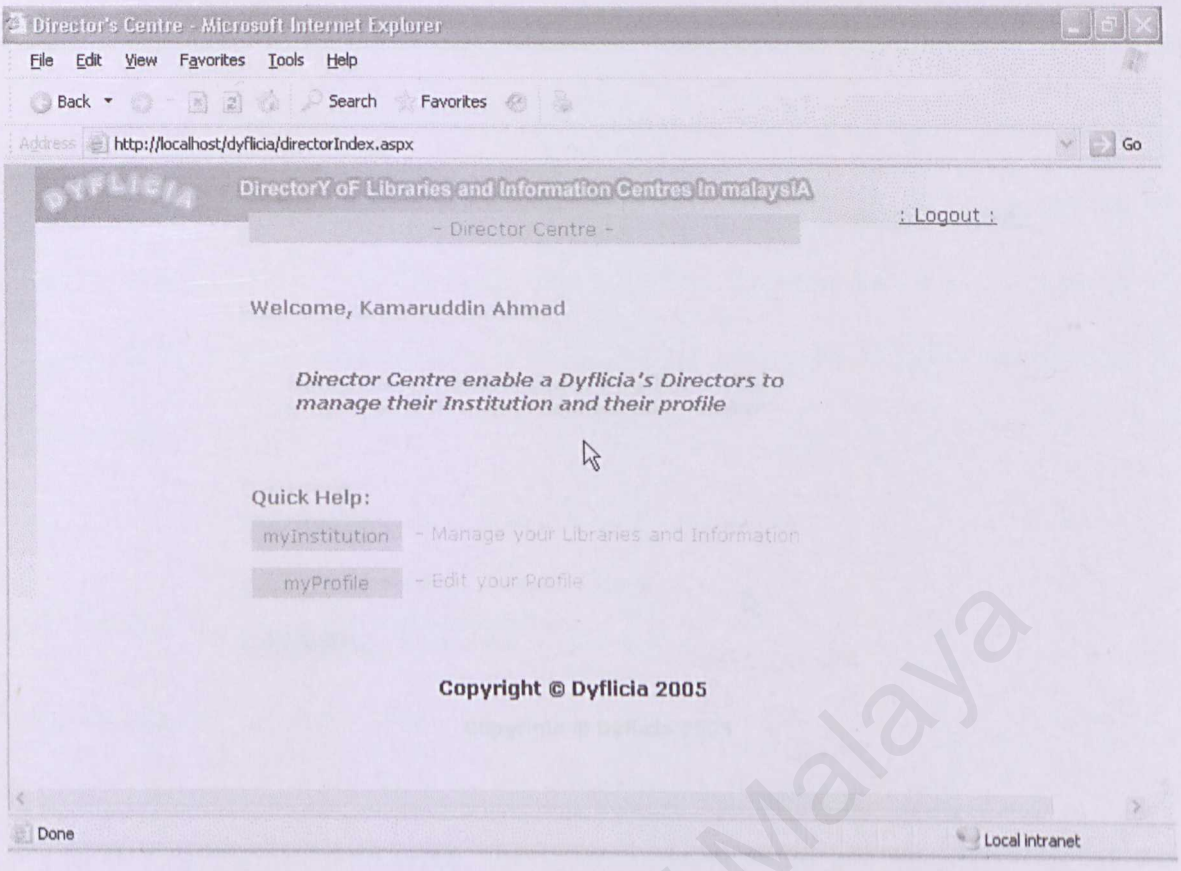

Figure 5.10 – Dyflicia's Director Centre
(If the member is a person-in-charge/director)

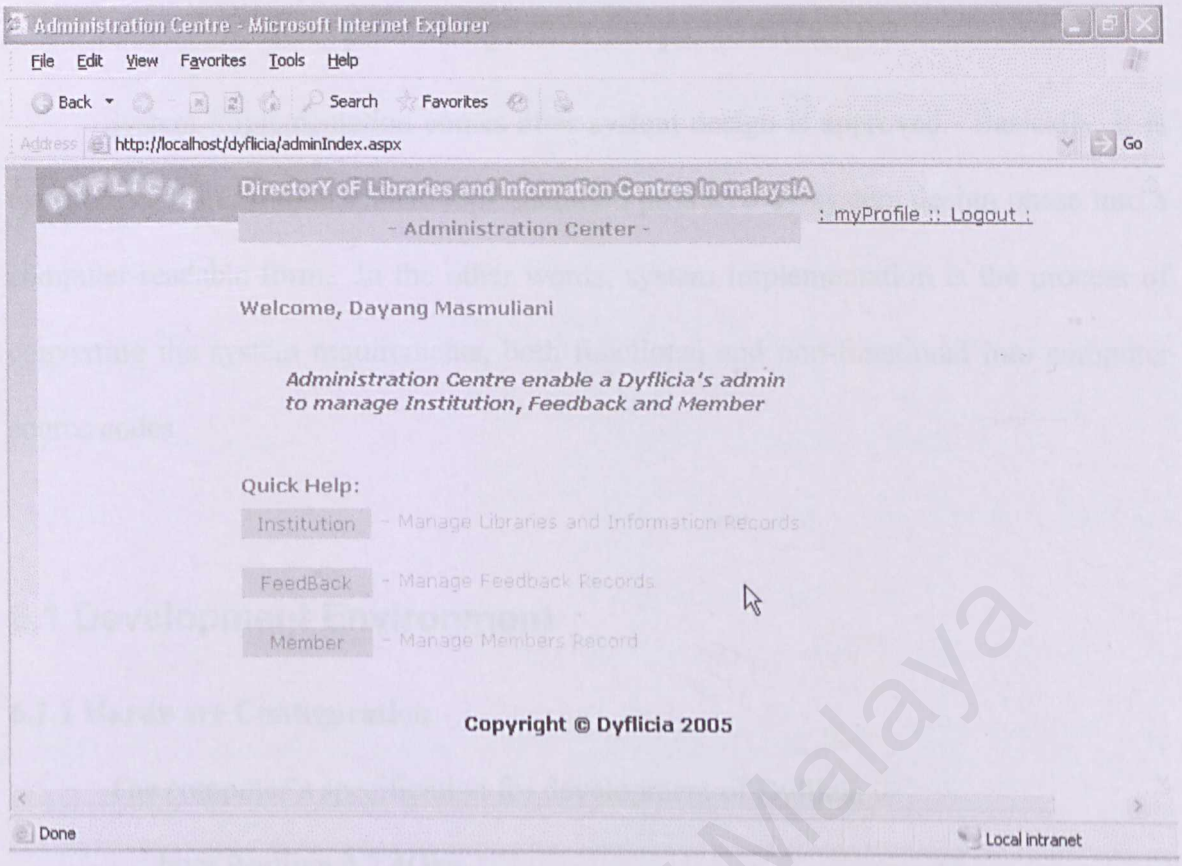

Figure 5.11 – Dyflicia's Administrator Centre

Chapter 6 System Implementation

System implementation comes after system design is approved. Basically, it is the process of translation system representation produced by system design phase into a computer-readable form. In the other words, system implementation is the process of converting the system requirements, both functional and non-functional into computer source codes.

6.1 Development Environment

6.1.1 Hardware Configuration

The computer's specification for development of Dyflicia is:

- Intel Pentium 4 2.4Ghz
- 512 MB RAM
- 40 GB Hard Disk
- 16 X DVD-ROM
- SVGA Graphics Adapter
- Keyboard and mouse as Input.

6.1.2 Software Tools

The software used can be categorized to two main purposes: report writing and system development. It is summarized in following table:

Table 6.1 – Software Tools

Software – Report Writing	**Description**
Microsoft Word 2003	Word processor for writing report
Microsoft Visio 2003	For producing Gantt chart, database diagram and flow chart
Software – System Development	**Description**
Microsoft Windows XP	Operation System
Microsoft Internet Information Services	Web Server for test-running Dyflicia
Microsoft Visual Studio.NET 2003 Architect Edition	System coding, interface design, tasks management and system debugging.
Microsoft SQL Server 2000 Personal Edition	Database server where all the data and information from Dyflicia is stored.
Internet Explorer 6	The main browser used for testing Dyflicia.
Adobe Photoshop CS	Design images for Dyflicia's interface

6.2 Program Coding

Coding is the process of translating system design's outcome into sources codes. The source codes are later accepted by the computer which will translate them into machine codes that will do as what human wish. Coding for Dyflicia is done in Microsoft Visual Studio.NET 2003 Architect Edition. Technology used is ASP.NET 1.1 scripting language is VB Script for server-side scripting and JavaScript for client-side scripting.

6.2.1 The Tool (Microsoft Visual Studio.NET 2003 Architect Edition)

Microsoft Visual Studio.NET 2003 Architect Edition is chosen as it is the best integrated development environment (IDE) tool available up-to-date. One of the functions that cannot be found in other IDE is the run-time debugging. Developer can debug while the system is running and this reduce debugging time and complexity.

Coding in Microsoft Visual Studio.NET 2003 Architect Edition is faster and less-time consuming. It supports coding-time error-check which checks for error during coding. For example, if there is a variable which is not declared, the coding interface will underline it.

For the interface, Microsoft Visual Studio.NET 2003 Architect Edition support drags and drop of the web and html controls. All the controls' properties can be easily modified at the design view of a webpage. Although it can do the interface design, Abode Photoshop CS is used to produce more attractive image for Dyflicia.

As a conclusion, Microsoft Visual Studio.NET 2003 Architect Edition is chosen because it is easy to use and time-saving.

6.2.2 The Technology (ASP.NET 1.1 with VB Script and JavaScript)

ASP.NET 1.1 is the newest version of the web-based technology from Microsoft. It has many advantages for both developers and users. We look at the four main advantages: (Source: http://www.brillianceweb.com/betterwebdesign/tips_52.aspx)

a) Powerful database-driven functionality

Like ASP (Microsoft's language preceding ASP.Net), ASP.Net allows programmers to develop web applications that interface with a database. The advantage of ASP.Net is that it is object-oriented and has many programming tools that allow for faster development and more functionality.

b) Faster web applications

Two aspects of ASP.Net make it fast -- compiled code and caching. In the past, the code was interpreted into "machine language" when your website visitor viewed your page. Now, with ASP.Net the code is compiled into "machine language" before your visitor ever comes to your site.

Caching is the storage of information that will be reused in a memory location for faster access in the future. ASP.Net allows programmers to set up pages or areas of pages that are commonly reused to be cached for a set period of time to improve the performance of web applications. In addition, ASP.Net allows the caching of data from a database so your website isn't slowed down by frequent visits to a database when the data doesn't change very often.

ASP.Net was tested and found to be over 10 times faster for the average user than Java's J2EE technology. While there have been some debates about the methods of the testing it is interesting to note that this has been validated by 3rd parties.

c) Memory leak and crash protection

ASP.Net automatically recovers from memory leaks and errors to make sure that your website is always available to your visitors.

d) Multiple language support

Programmers can actually write their code in more than 25 .Net languages (including VB.Net, C#, and JScript.Net). This allows programmers to develop your site in the language they know best and it means that you can more easily find programmers to support the work on your site.

For Dyflicia's development, VB script is used as the main server-side scripting. This is because of the VB Script is easier to learn than C#. Moreover, developer of Dyflicia has basic knowledge in VB Script.

JavaScript is used in Dyflicia for client-side scripting. In Dyflicia, it is used to confirm delete of record to prevent record being accidentally deleted. Besides, it is used to catch user's <Enter> key press.

6.2.3 Coding Standard

A coding standard is important to develop a system that is reliable and easy-to-maintain. Before coding starts, a standard will be set and it will be followed by all modules. The standards can be categorized into following sub-sections:

a) Readability

This is not a major problem when coding within Microsoft Visual Studio.NET 2003. Developer does not need to worry about the readability of the codes. This is because the IDE automated the indents and spaces when it is needed to differentiate the codes. For examples, statements in a function will be indented to differentiate them from the function's definitions.

b) Naming Technique

In this context, naming refers to giving a name (declaring) for a variable, web controls, functions or subs. Good naming technique is important to make the codes easier to understand and easier to de referred during coding phase.

For example, a string for storing a name is declared as:

Dim strName 'for storing name

A textbox for getting a name is named as:

txtName

A function for generating ID is name as:

Function generateID ( )

With this techniques, developer will know that, *strname* is a string for name, *txtName* is a textbox for name and *function generateID( )* is a function for generating ID.

c) Internal documentation

Internal documentation means commenting the codes. All modules and codes in Dyflicia will be commented. This is important to make the codes easier to understand and also provide a means for other developers in the future in case they come through the codes. Basically, internal documentation makes maintenance easier for both Dyflicia's developer and other future's developers.

6.3 Database Development

The development is done through the Enterprise Manager in Microsoft SQL Server 2000. After the database design is validated and approved, tables are created in Enterprise Manager. Enterprise Manager provides a user-friendly interface for creating database, tables and columns without too much hassle.

For Dyflicia's database, a naming standard is followed to enable easy identification. The database itself is named as *dbDyflicia*. For table, it is started with *tbl* and followed by table's name. *tblMember* for example is for member's table. For *tblMember's* columns, the columns' name starts the *m* and followed by column's name. For example, *mName* refers to member's name.

6.4 Interface Design

Interface in Dyflicia is lightweight to enable fast loading of information needed by users. All graphics used are designed and optimized for web by using Adobe Photoshop CS. Designs, fonts and colours chosen are used consistently throughout all modules in Dyflicia to enable users to get familiar with the system faster and easier.

6.5 System Implementation Summary

As a summary for Chapter 6, we can see that the implementation of Dyflicia focus on various aspects from coding till interface design. This phase takes the longest time among all the phases. It is followed by system testing to make sure all the functional and non-functional requirements are followed. This phase will be discussed in the following chapter.

Chapter 7 System Testing

System testing is needed to establish the presence of software defects, if any. It is done thoroughly to discover errors in the system. On the other hand, system testing is also used to demonstrate the system's capability and to make sure it is working accordingly to the system requirements. For Dyflicia, testing is done in two phases. The first phases is component testing and the second phase is the integration testing.

7.1 Component Testing

Component testing tests the individual program components of a system. For Dyflicia's component testing, structural testing or sometimes called the white-box is used. In structural testing, test cases are derived according to the program's structure. Additional test cases can be derived from the developer's knowledge of the program. Test output then will be validated to make sure the component is working properly.

For example, a small component, the add institution module in Dyflicia is tested with an institution details. The component here is the add institution module, test case is an institution's details and test output is the successfully updated institution table.

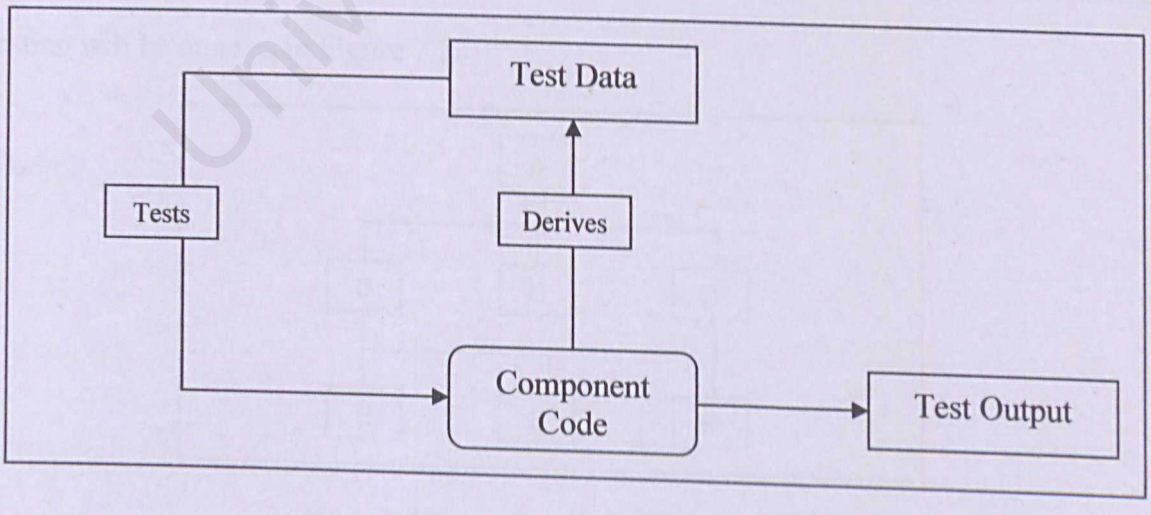

Figure 7.1 Structural Testing

7.2 Integration Testing

After component testing is done, all the program components must be integrated to create partial or complete system. After the integration, integration testing must be done to make sure it is working correctly. One of the problems in integration is to localize the error that is occurred. Therefore, incremental integration testing is used to reduce this problem.

For Dyflicia's integration testing, bottom-up approach is followed. In this approach, each component at the lowest level of the system hierarchy is tested individual first. Then, the next components that will be tested are those that call the previously tested one. This approach is followed repeatedly until all components are included in the testing.

For example, in the administration's member management module, all its sub-modules are tested first before the whole member management module is tested. Here, add member, search member, edit member and delete member are tested first before the member management module is tested.

Let's say the component hierarchy is illustrated as Figure 7.2, its bottom-up testing will be done as in Figure 7.3.

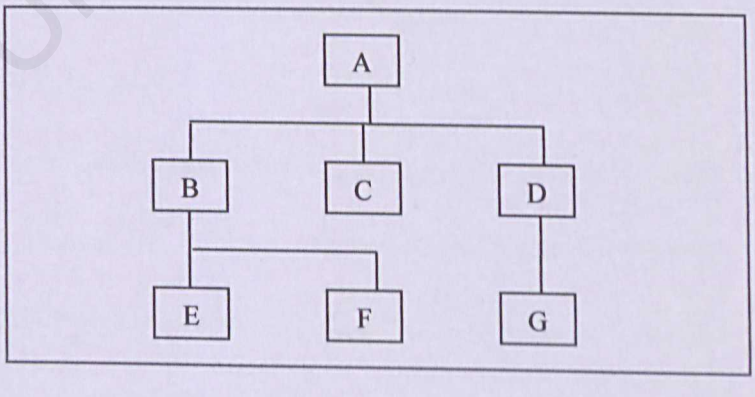

Figure 7.2 Example of Component Hierarchy

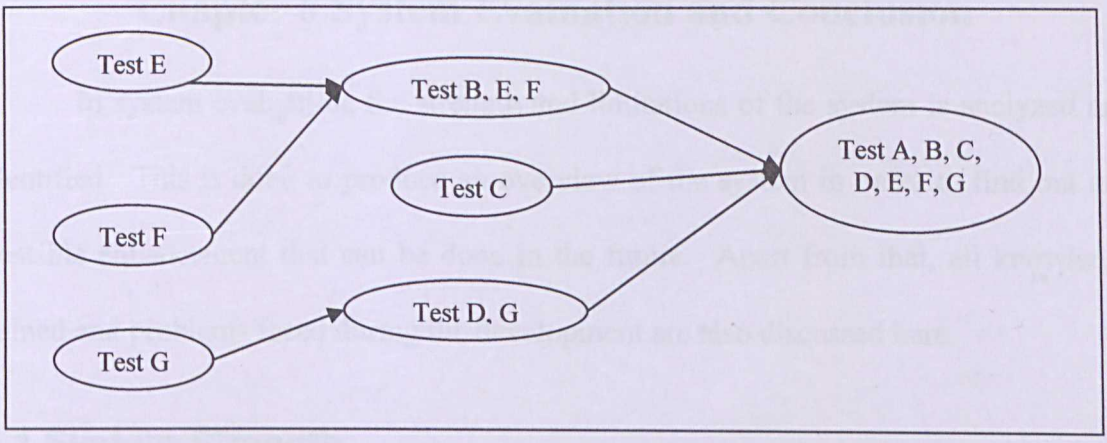

Figure 7.3 Bottom-Up Testing

7.3 System Testing Summary

System testing should be done thoroughly and continuously before the system is launched. It should not be neglected as human make mistakes. After system testing, Dyflicia is evaluated for its functionality, performance, limitations and its future enhancement consideration. These evaluations will be discussed in the next chapter.

Chapter 8 System Evaluation and Conclusion

In system evaluation, the strength and limitations of the system is analyzed and identified. This is done to produce an overview of the system in order to find out any possible enhancement that can be done in the future. Apart from that, all knowledge gained and problems faced during the development are also discussed here.

8.1 System Strength

Dyflicia's strengths are listed as following

a) Input data validation

Dyflicia performs data validation when it is needed. For example, if users provide an invalid email address, Dyflicia will tell the users that the email address is invalid. Users are then required to correct their email address.

b) No keyboard skill required

The drop down list used in Dyflicia allows users to choose values without typing. For examples, users can choose from the list of states and types of institution from the Browse module.

c) User friendly interface

The colours and fonts used in Dyflicia are consistent throughout all the modules. Textboxes, drop down lists, buttons, data grids and other controls are located at suitable locations. This allows users to get familiar with the system faster and easier.

d) Search Module

Dyflicia has an advanced search module. It supports searching from institution's keyword, name, description, director, services, programme and equipment. Users can choose to search "All the word", "Any of the word" and "The exact phase".

e) Director's module

With Director's module, a person-in-charge or called a director of an institution can add a library or information centre. This reduces the administrator's work as he or she does not need to add all the existing libraries and information centres. Any changed information about an institution can also be updated by the director of the institution.

f) Password protected

All modules that will make changes to the database will required the users to login, except the Add Feedback module. This is to prevent unwanted changes and damages to the database.

g) Friendly error message

All modules are protected from crashing if the web server or database server is not running or crashed. A friendly error message will tell the users that an error has occurred instead of allowing the page to crash.

h) Fast Loading

Each page in Dyflicia is designed to be light and fast loading. The banner used is same for every page and this will take the advantage of browser's cache. All graphics are optimized for the web by using Adobe Photoshop CS.

i) Easy and anytime accessibility

Dyflicia is a web-based application and can be accessed from anywhere anytime via the Internet.

j) Cross-browsers compatibility

Dyflicia is tested on three major web browsers: Internet Explorer 6, Firefox 1.0, and Opera 7.54. Although all the functionalities are working, Firefox and Opera show limitations in certain area which will be discussed the next part: System Limitations.

k) Image module

Dyflicia has an image module for users to upload an institution's image. This gives users to have a glance how an institution looks like. All images are stored into the database without creating extra folder and files in the server. This will prevent files overload. Besides, this will also ease the backup of the system without the need to copy all the images manually.

8.2 System Limitations

Dyflicia's limitations are stated as following:

a) Cross-browser compatibility

Firefox 1.0 and Opera 7.54 are the two web browsers that are gaining popularity (Source: http://www.w3schools.com/browsers/browsers_stats.asp)

They are not fully compatible with Dyflicia. The ASP.NET's validation's controls do not works as it should in these two browsers. Besides, the size and colour of web controls used in Dyflicia changed to different size and colour. Therefore, a reminder is provided at the main page of Dyflicia stating that Dyflicia is best viewed with Internet Explorer 6.

b) Database Users and Backup

There is no module in Dyflicia that support new database administrator creation and database backup. New database administrators and database backup can only be done via Enterprise Manager.

c) Information provided

Only the following types of library and information centre are provided:

1. National Library of Malaysia
2. Academic – University and Colleges (Exclude Secondary and Primary School)
3. Public/State
4. Special Libraries – Government and Non-Government

Only the following information of a library or information centre are provided.

1. Name
2. Type
3. Description
4. URL
5. Picture
6. Address
7. City/Town
8. State
9. Person-In-Charge
10. Contact Number
11. Opening Hours
12. Open To (example: Public, member, staff)
13. Collection Size (Printed)
14. Catalogue Form (example: Card)
15. Catalogue Type (example: Author/Title; Subject)
16. Catalogue Code (example: AACR II)
17. Classification Scheme (example: Dewey Decimal)
18. Services Provided (example: Lending, current awareness)
19. Special Programme (example: English Class)
20. Special Equipment (example: OHP)

d) Language used

Dyflicia will be using English as the medium and it does not support multi-language.

8.3 Future Enhancement

A system is never complete as it needs to be changed, modified or enhanced to meets changing requirement and evolving technology. Hopefully, the next version of Dyflicia will come with following enhancements:

a) Database Management Module

This module will be considered for Dyflicia's future enhancement. With this module, backup of database can be done easily. Besides, database administrators can also be maintained and their password can be changed via a user-friendly interface.

b) Attractive and Interactive Interface

Dyflicia will attract more users if its interface is more attractive and interactive. This can be done by using Flash and CSS technology.

c) More modules

Hopefully, more modules can be added to Dyflicia. Modules such as interactive map to find an institution or a forum for discussion should attract more users.

8.4 Problems and Solutions

a) Knowledge in web-based programming

With very basic of web-based programming such as HTML, ASP.NET, VB Script and JavaScript, a lot of studies and reading is done within limited time. Studies of the technologies used are done parallel with system development.

b) Knowledge in database

Knowledge in database is also limited. Studies are done on Microsoft SQL Server 2000, database development and SQL Language in a short time.

c) Knowledge in interface design

Knowledge in interface design in also limited. Therefore, learning on Adobe Photoshop CS also is done in a short time.

8.5 Knowledge Gained

After the development of Dyflicia, the knowledge gained is:

a) Learnt to use Microsoft Visual Studio.NET 2003 to develop ASP.NET's web-based application.

b) Learnt to use VB Script as server-side scripting for ASP.NET

c) Learnt ADO.NET for database manipulation in ASP.NET

d) Learnt SQL Language for querying database

e) Learnt Adobe Photoshop CS for image manipulating

f) Learnt to work independently

g) Developed skill in documentations using Microsoft Word 2003 and Microsoft Visio 2003.

8.6 Conclusion

Although Dyflicia has its limitations and is not mature yet, it has achieved its objectives and has its own strength. It is now can be used as a web based system to organize, search and retrieve information on libraries and information centres in Malaysia. It also has advanced modules, the director module and the image module. Hopefully, future enhancement stated previously can be done on Dyflicia to produce a better version.

Appendix A – User Manual

Chapter 1

1.1 Run-time requirement

The software run-time requirements for Dyflicia are:

- Microsoft Windows 98 Second Edition and above
- Internet Explorer 6 and above

The hardware run-time requirements for Dyflicia are:

- Intel or AMD based Processor
- Random Access Memory of 32 MB
- SVGA Graphic Adapter
- Modem for Internet Access
- Internet Access

1.2 User Manual Overview

Chapter 1
The software and hardware requirement of Dyflicia

Chapter 2
Highlight the public user's pages

Chapter 3
Highlight the director's pages

Chapter 4
Highlight the administrator's pages

Chapter 2 Public User

2.1 The Public's Main Page

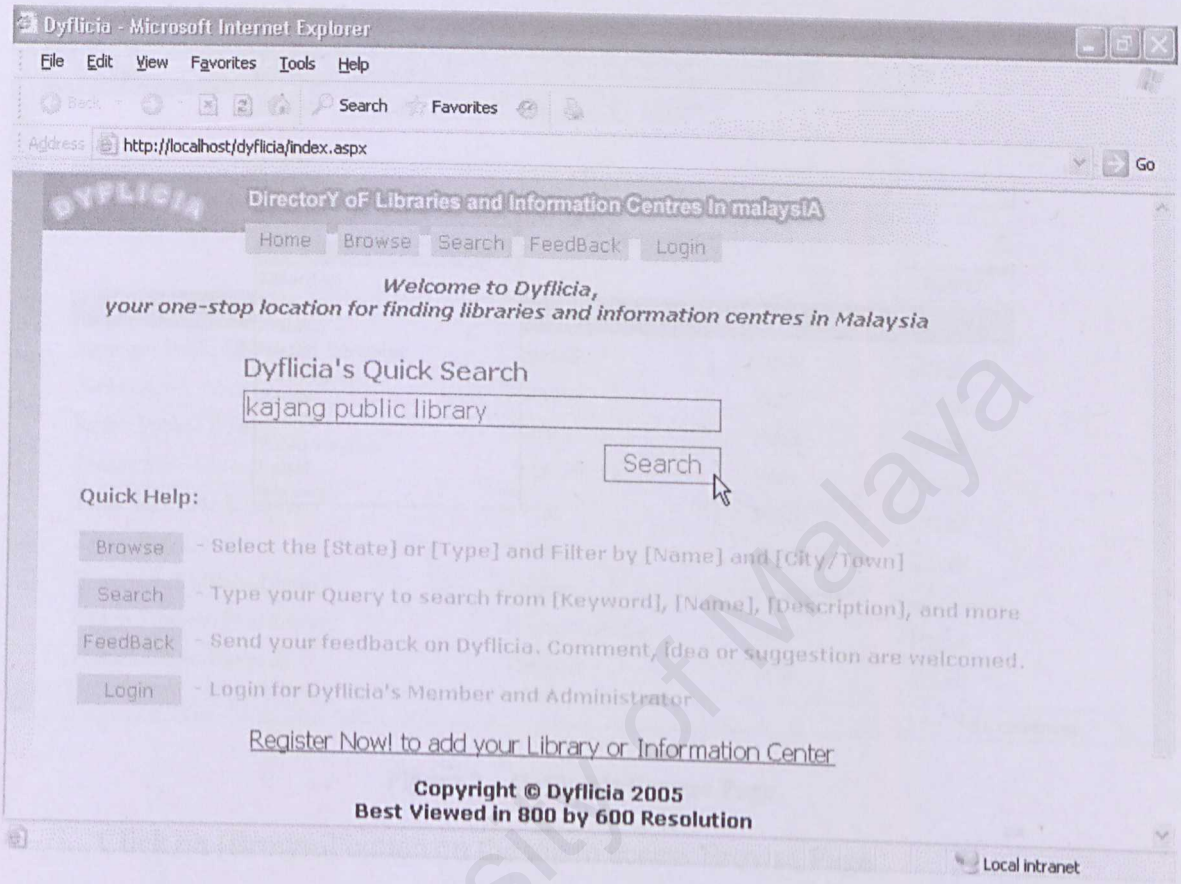

Figure 1 – Dyflicia's Public Main Page

This is the main page for public users who visit Dyflicia. Type in query in Dyflicia's Quick Search to search for an institution.

2.2 Browse Page

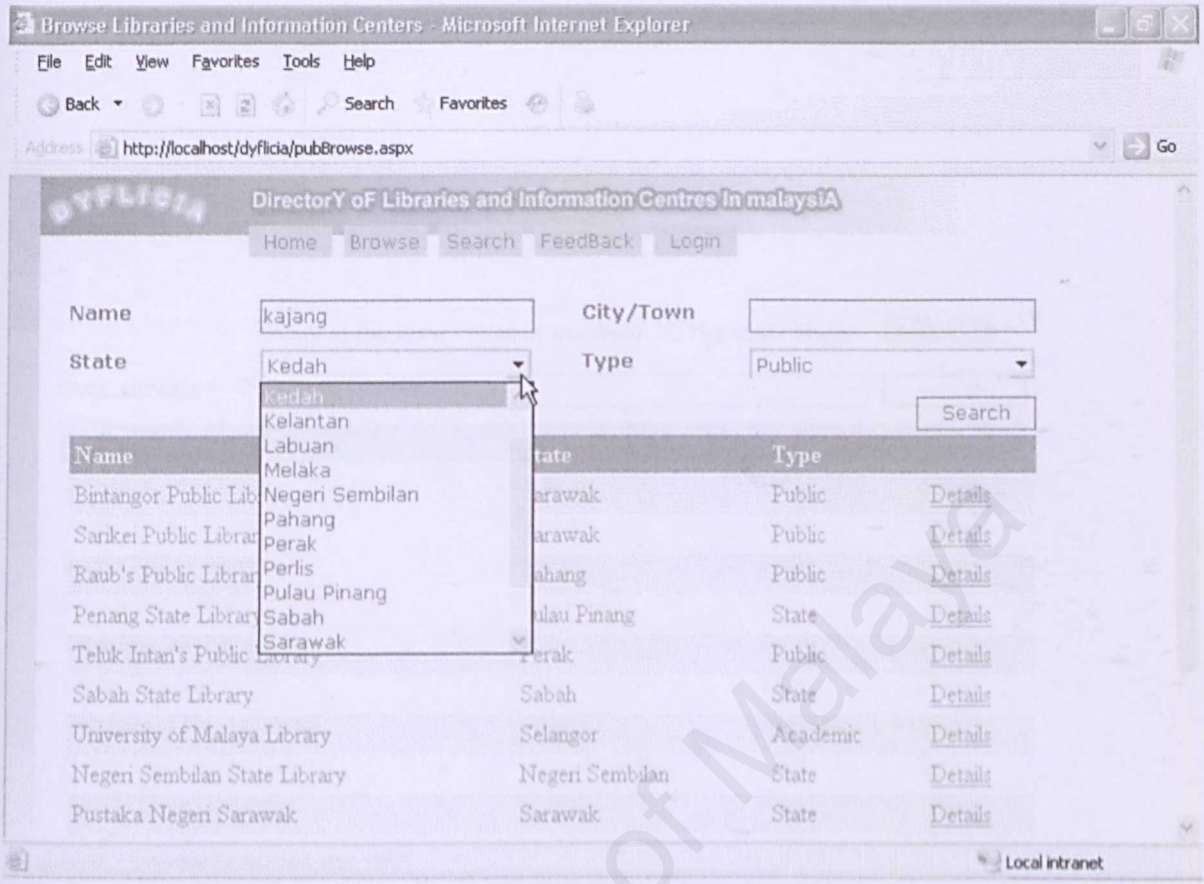

Figure 2 – Dyflicia's Browse Page

i. Click on [Browse] button on the top to access Browse Page.

ii. Choose [State] or/and [Type] of institution to locate an institution.

iii. [Name] and [City/Town] can be used to filter the result.

iv. Click [Search] button to start browsing.

v. Click [Details] link to see full details of an institution

2.3 Search Page

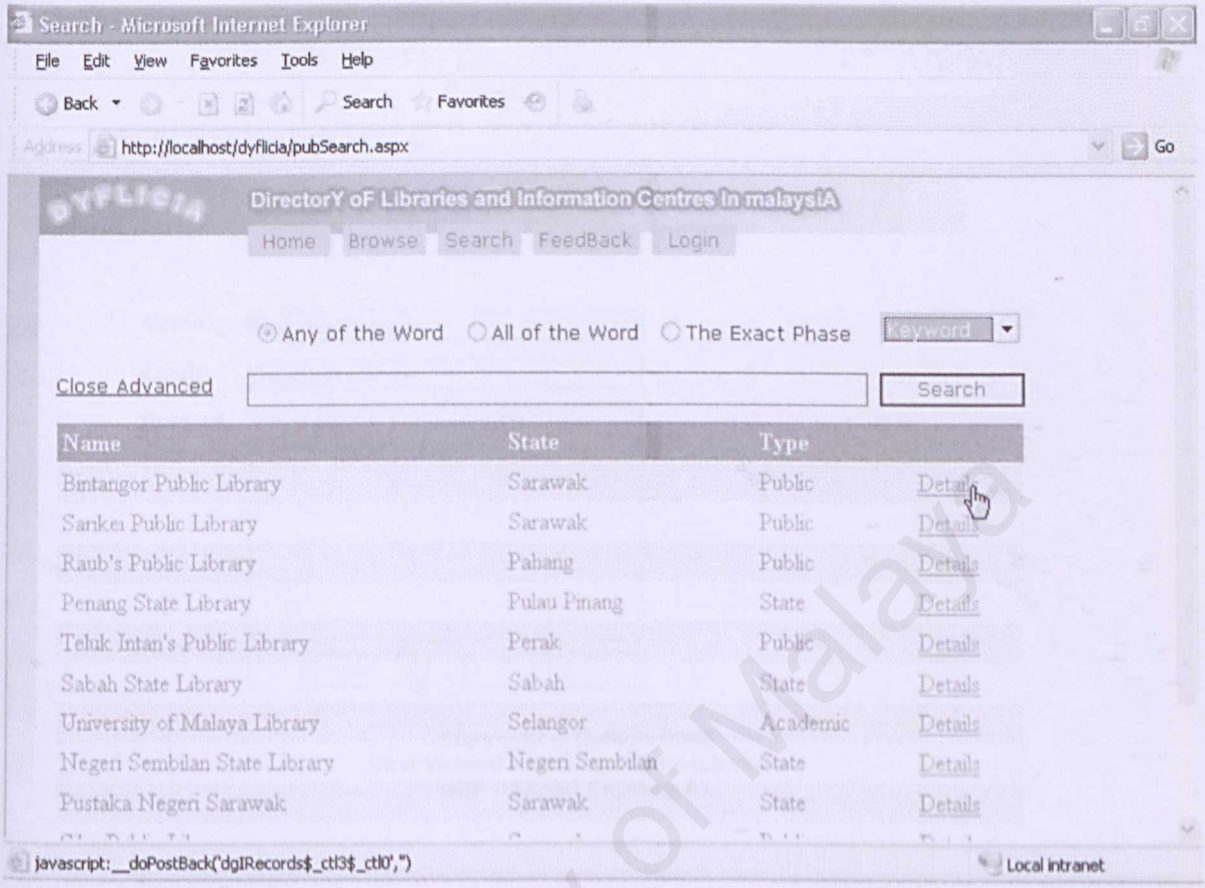

Figure 3 – Dyflicia's Search Page

i. Click [Browse] button on the top to access Browse Page.

ii. By default, searching will be based on "Any of the Word" from Keyword field.

iii. Click [Show Advanced] or [Close Advanced] to show/hide advanced search

iv. Choose advanced option and field.

v. Click [Search] button to start searching.

vi. Click [Details] link to see full details of an institution

2.4 Feedback Page

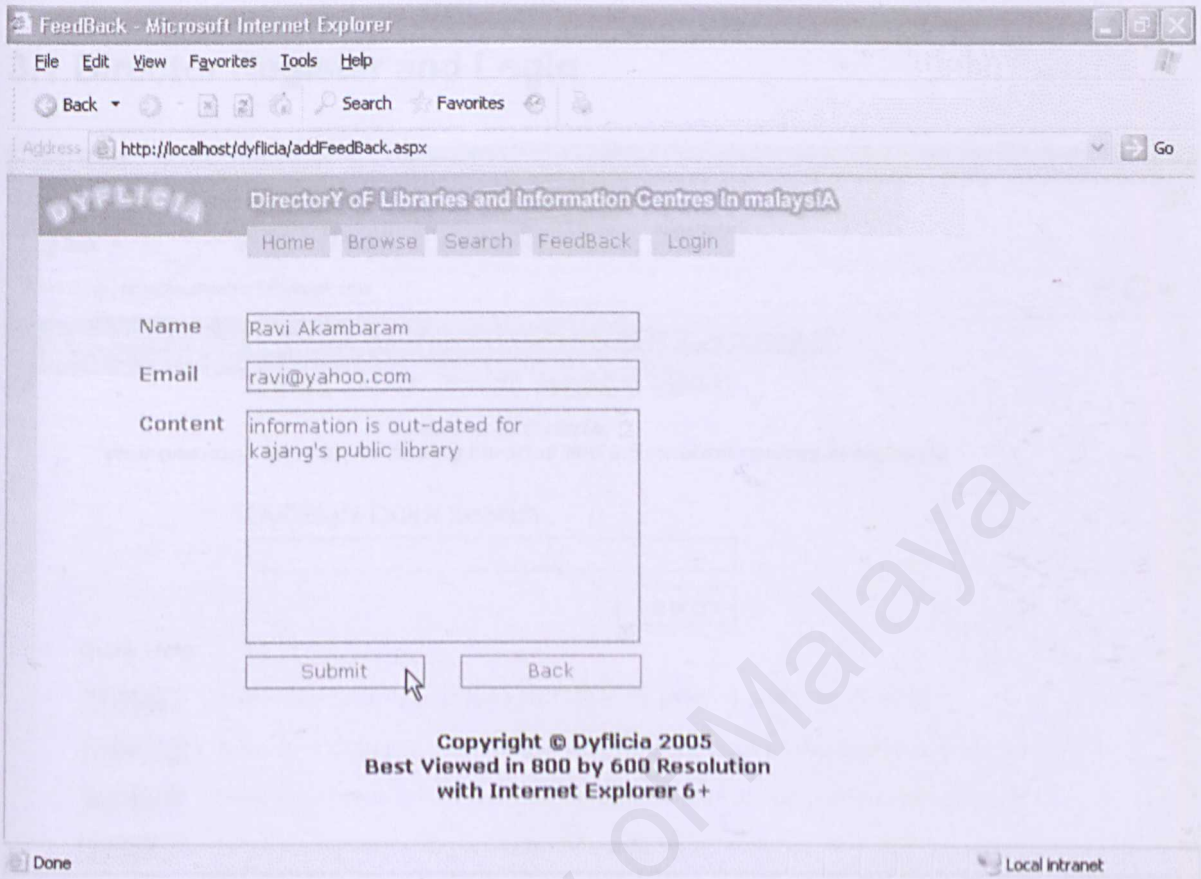

Figure 4 – Feedback Page

i. Click [Feedback] button on the top to access Feedback Page.

ii. Fill in all required information.

iii. Click [Submit] button to submit feedback.

Chapter 3 Director Module

3.1 Director Register and Login

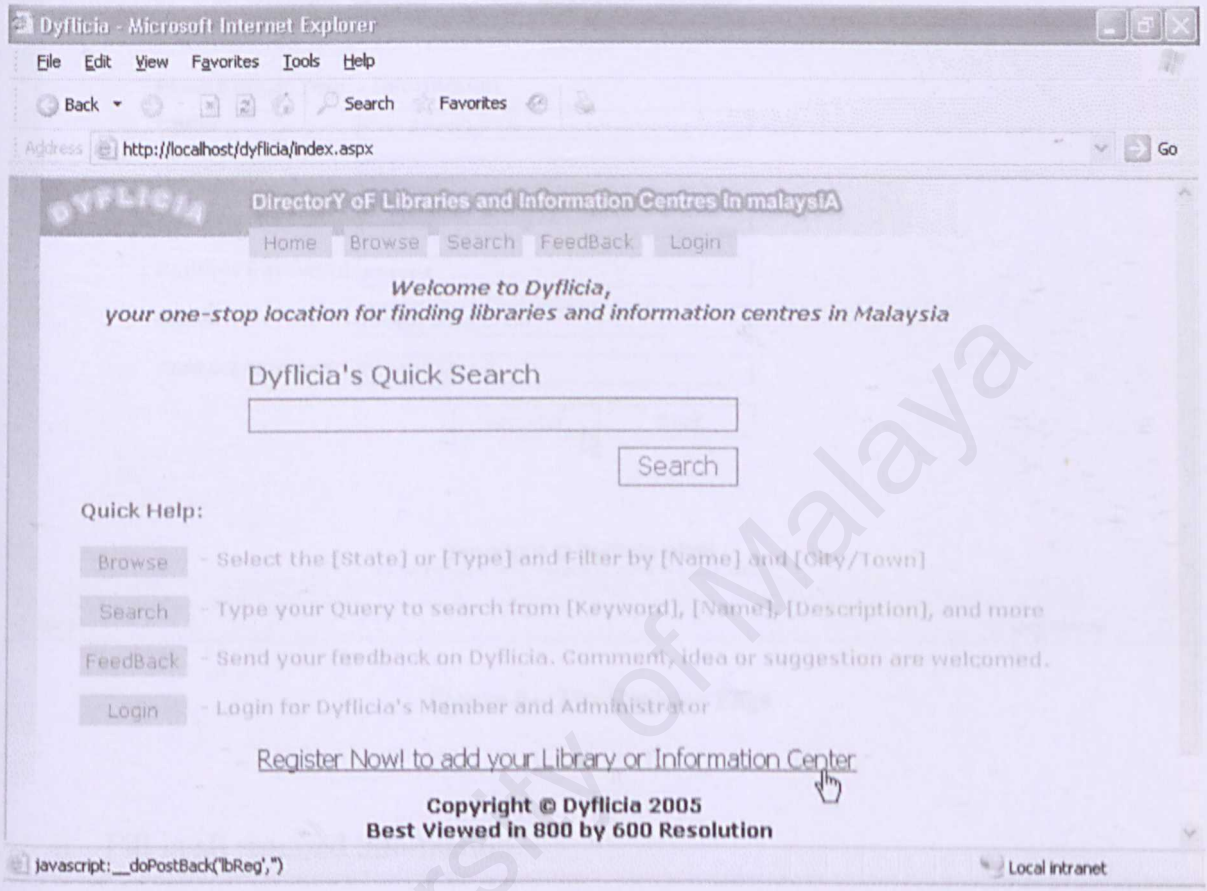

Figure 5 – The Register link

i. Click [Register Now!] link in the Main Page or Login page to register as a Director.

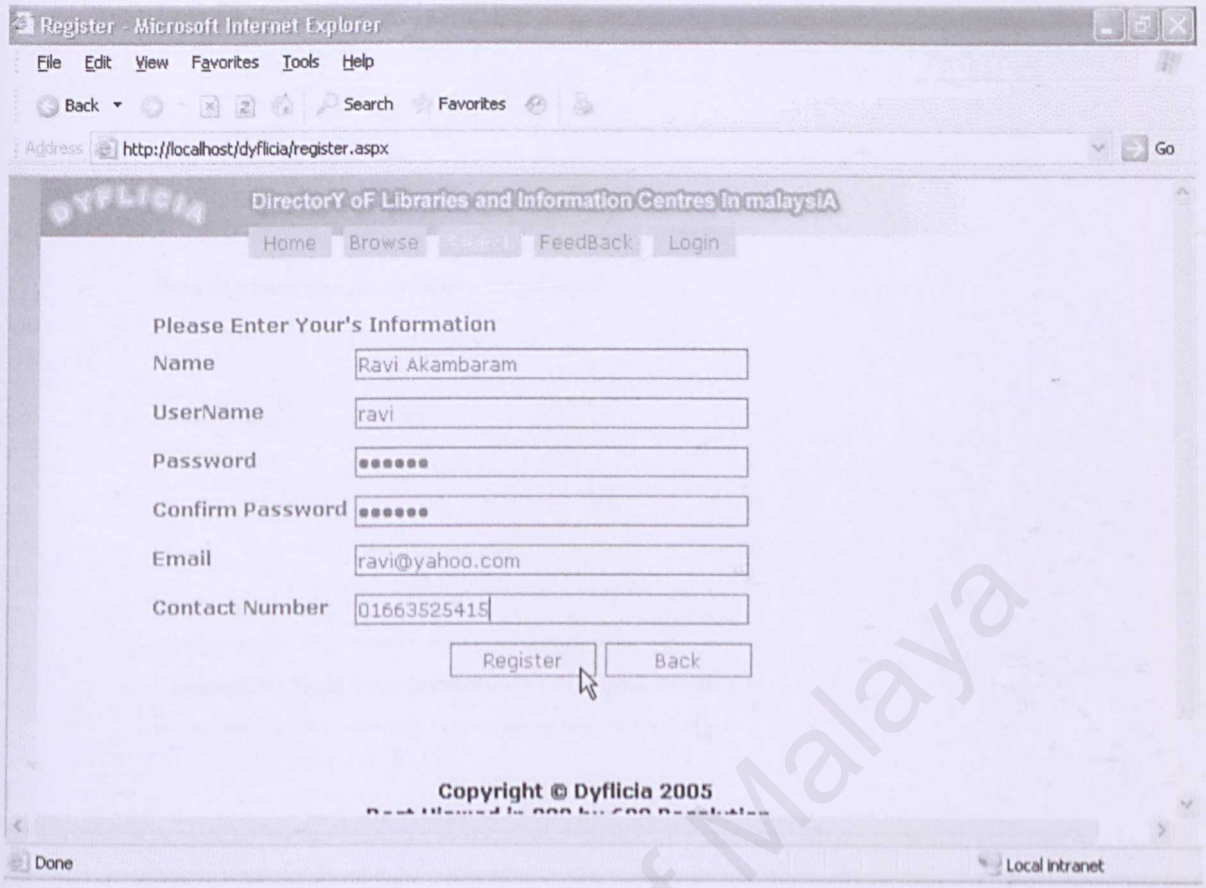

Figure 6 – The Register Page

ii. Fill in all required information

iii. Click [Register] button to register as a Director

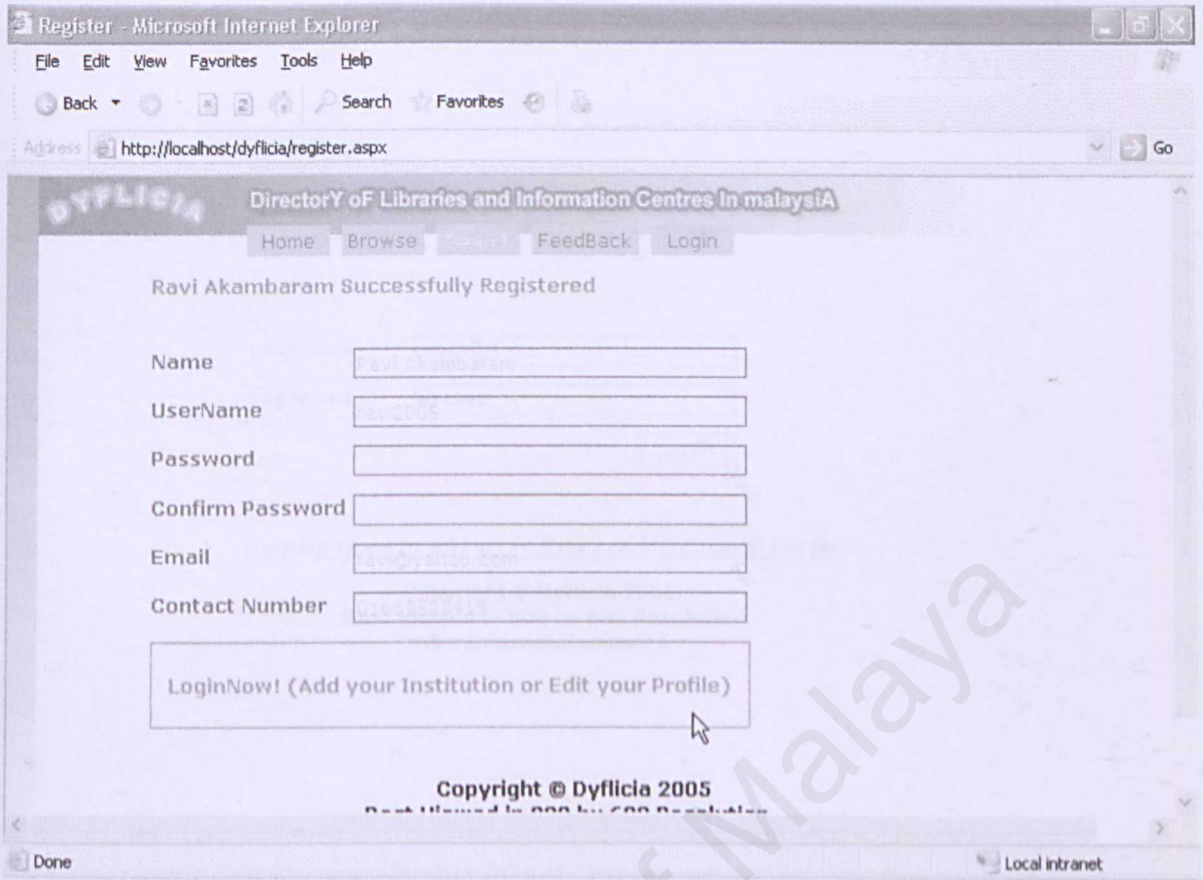

Figure 7 – Registration Successfully

iv. Registration successful.

v. Click [Login] button on the top to login.

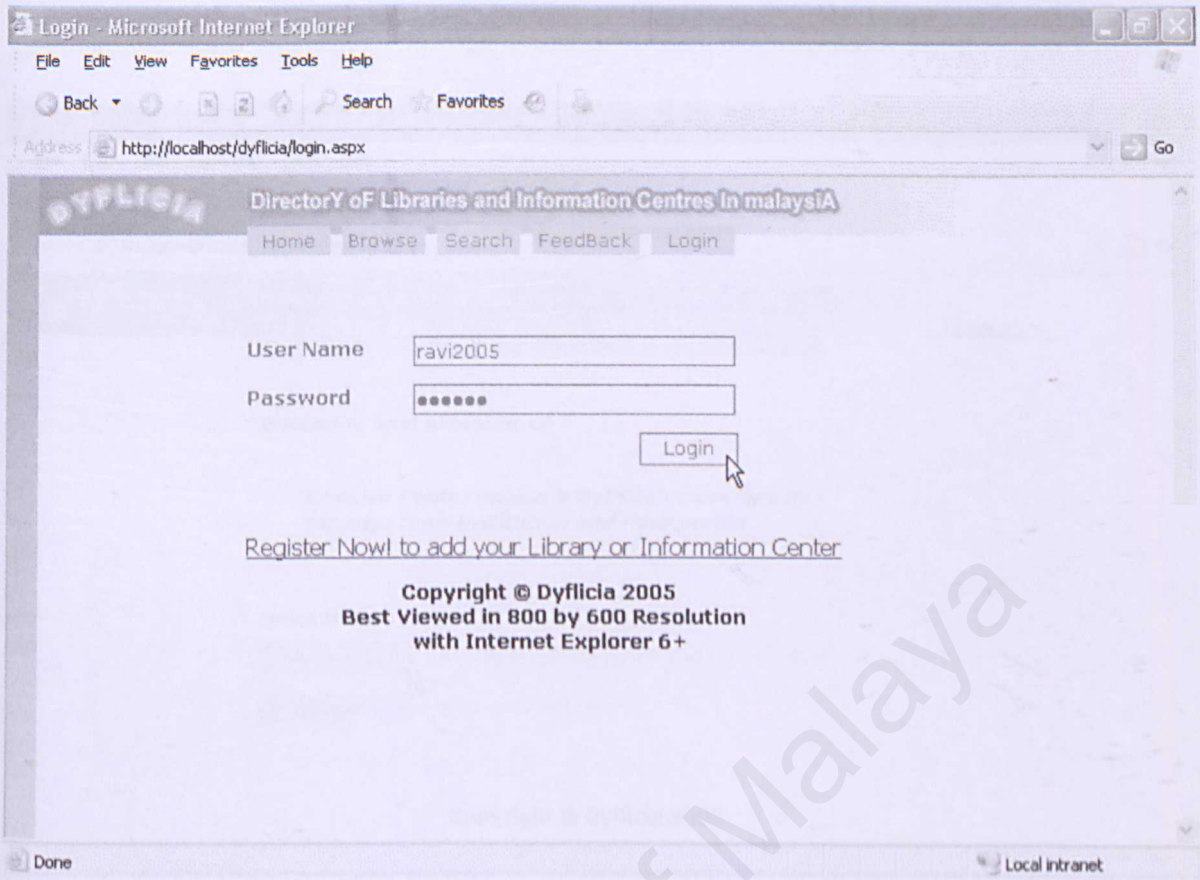

Figure 8 – Login Page

vi. Type in username and password to login.

3.2 Director Add Institution

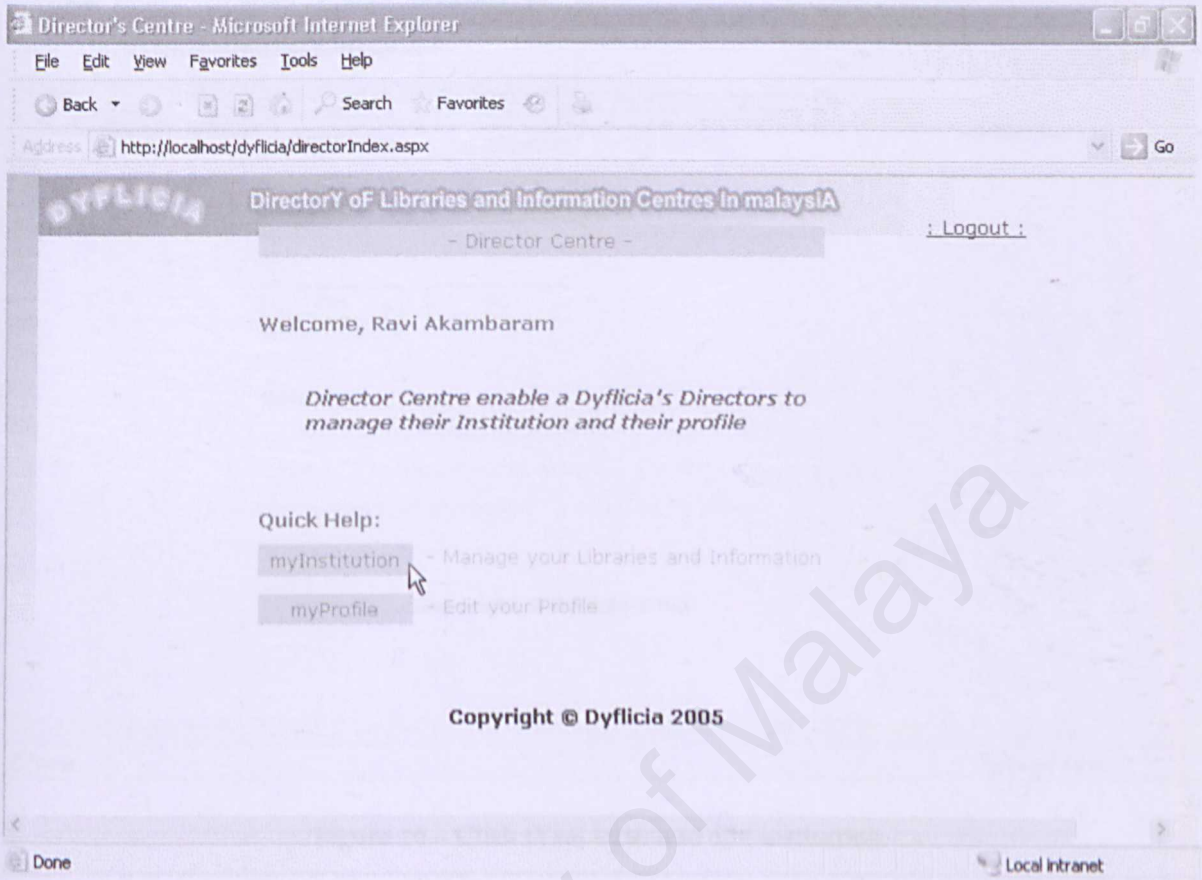

Figure 9 – Director Centre

i. After login, click [myInstitution] button to add institution

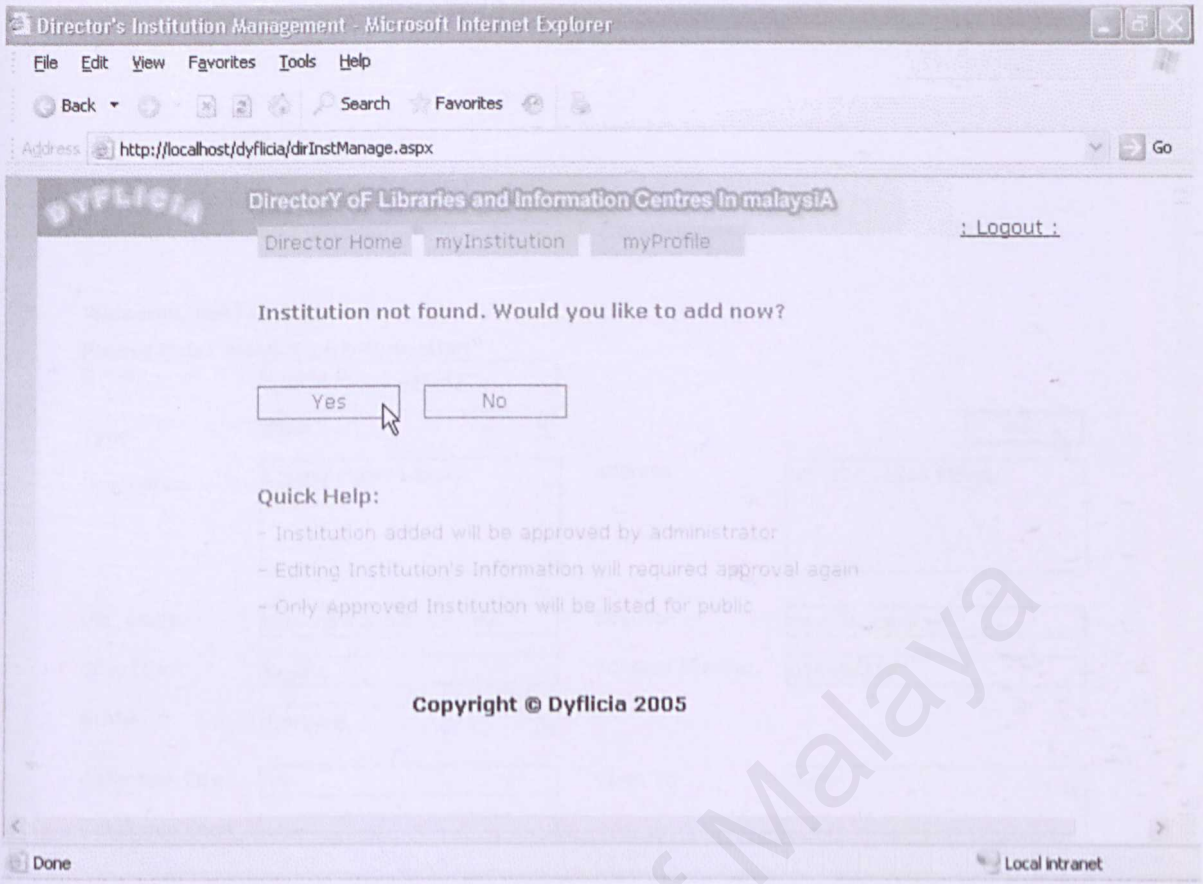

Figure 10 – Click [Yes] button to add institution

ii. The screen above will be shown. Click [Yes] button to add institution.

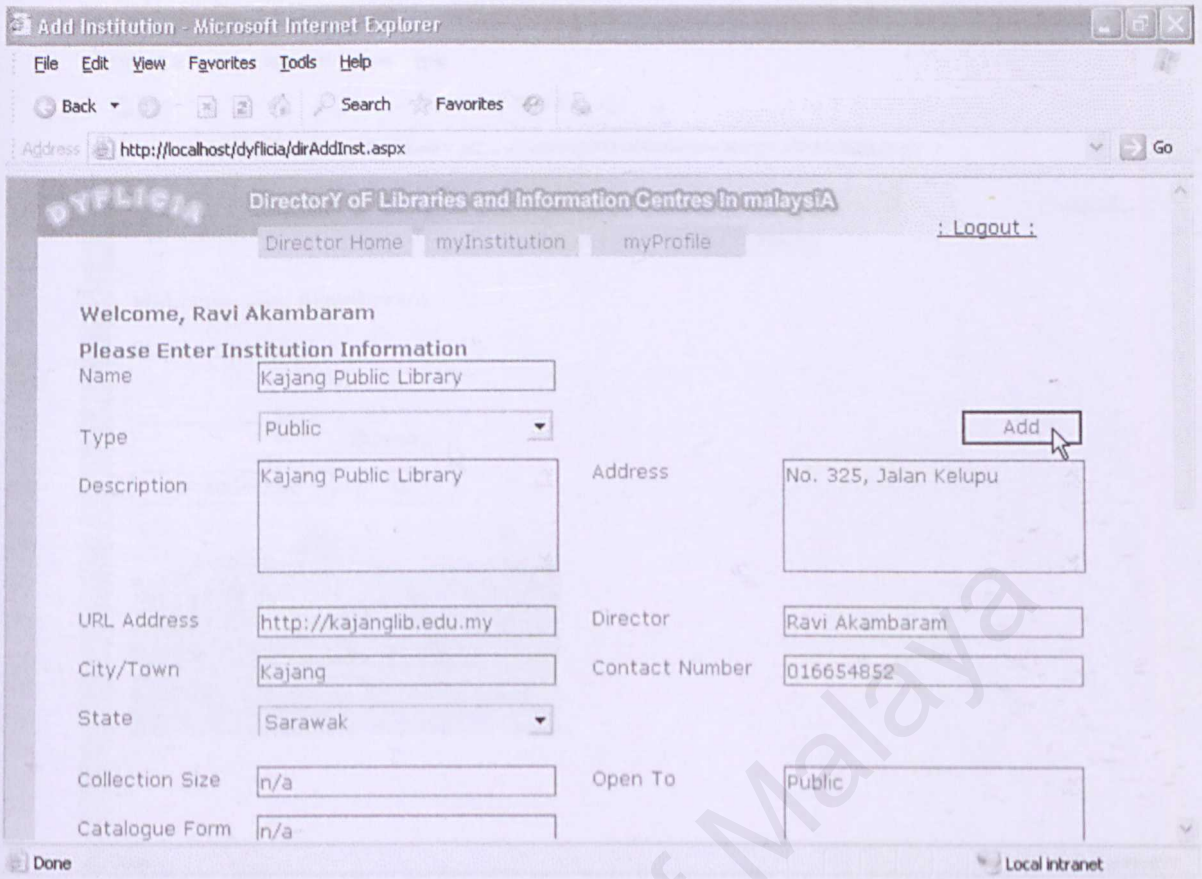

Figure 11 – Fill in all information

iii. Fill in all required information and click [Add] button to add institution.

iv. In the next page, Director can upload an image for the institution.

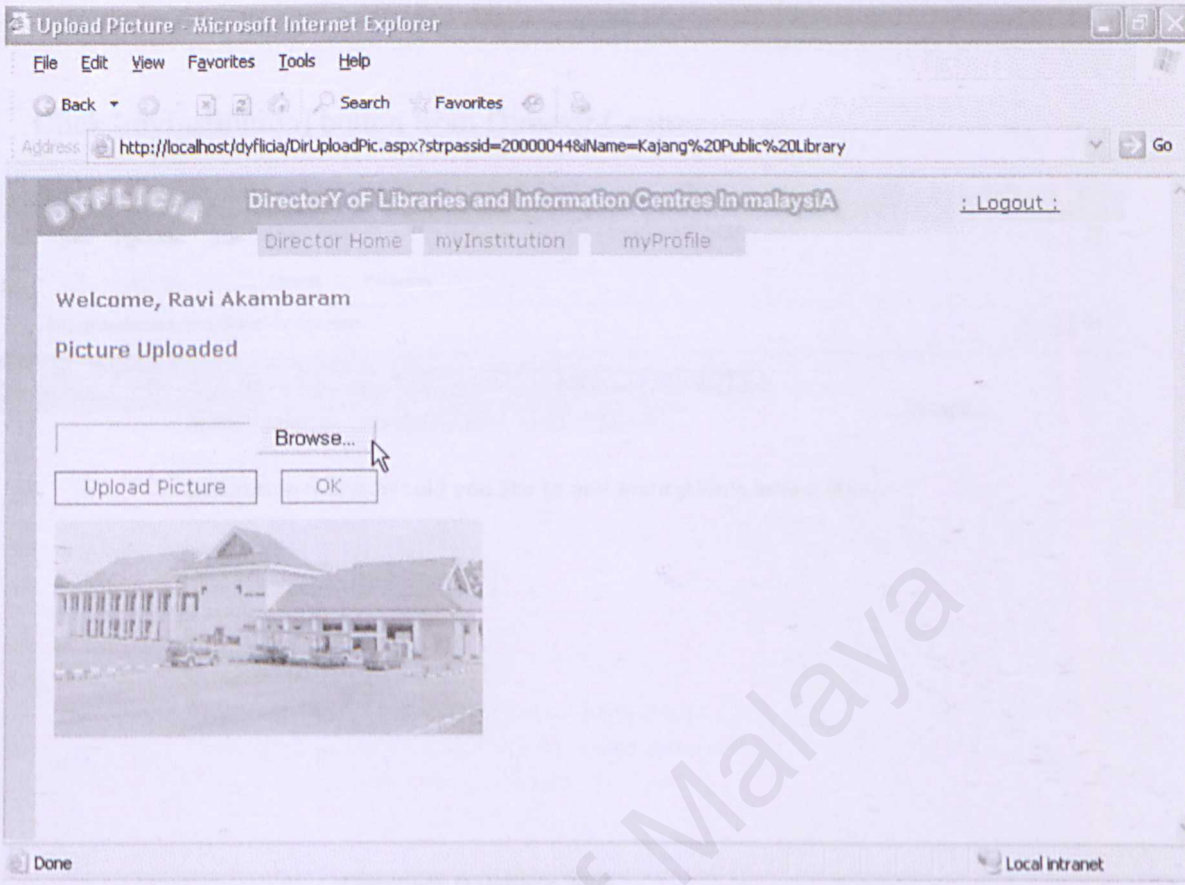

Figure 12 – Image upload page

v. Click [Browse] button to choose an image.

vi. Click [Upload] button to upload chosen image.

vii. Uploaded image is shown in the same page.

viii. Click [OK] button to return back to update information for institution.

ix. Please keep in mind, a new added institution will need approval from administrator before it is shown to the public.

3.3 Director Edit Institution's Information

i. Click [myInstitution] button from Director Centre.

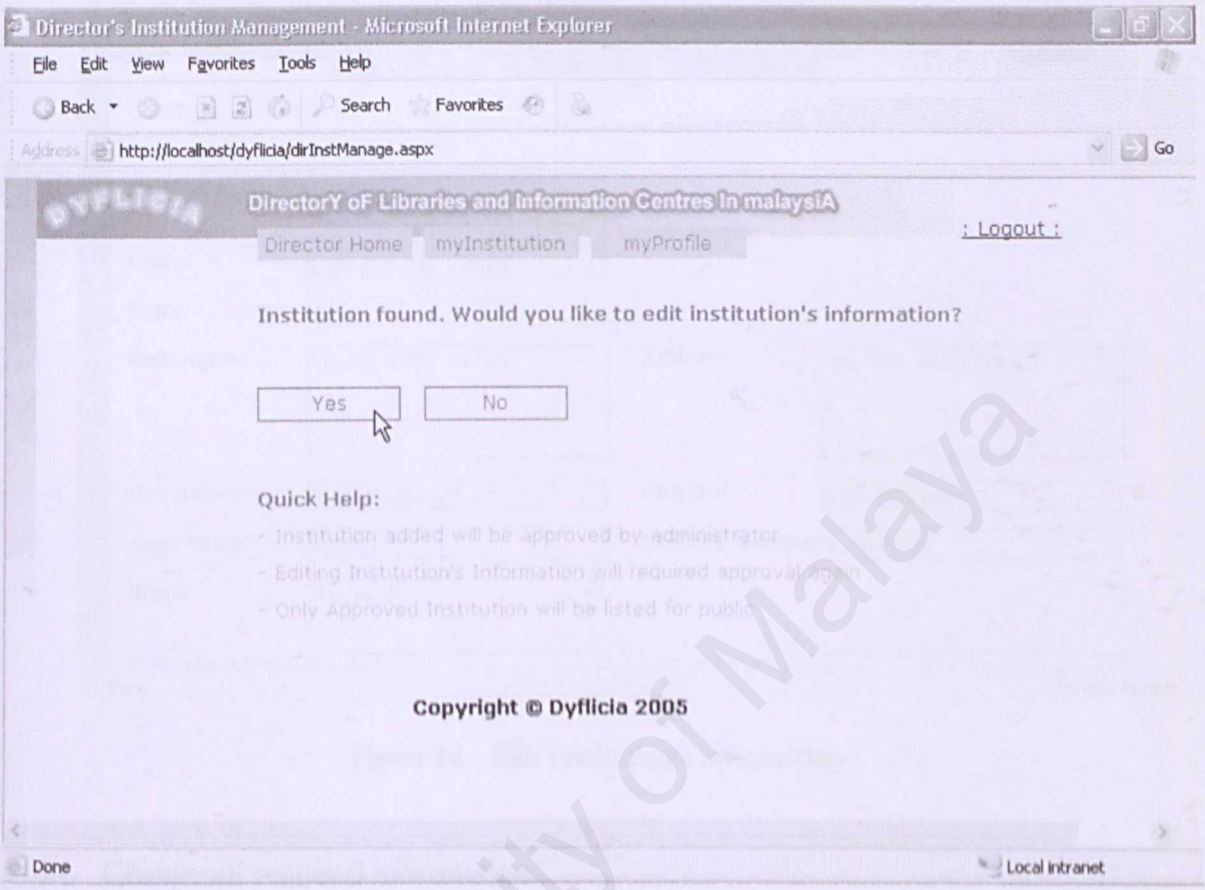

Figure 13 – Edit Institution Information

ii. Click [Yes] button in the next page to edit institution's information.

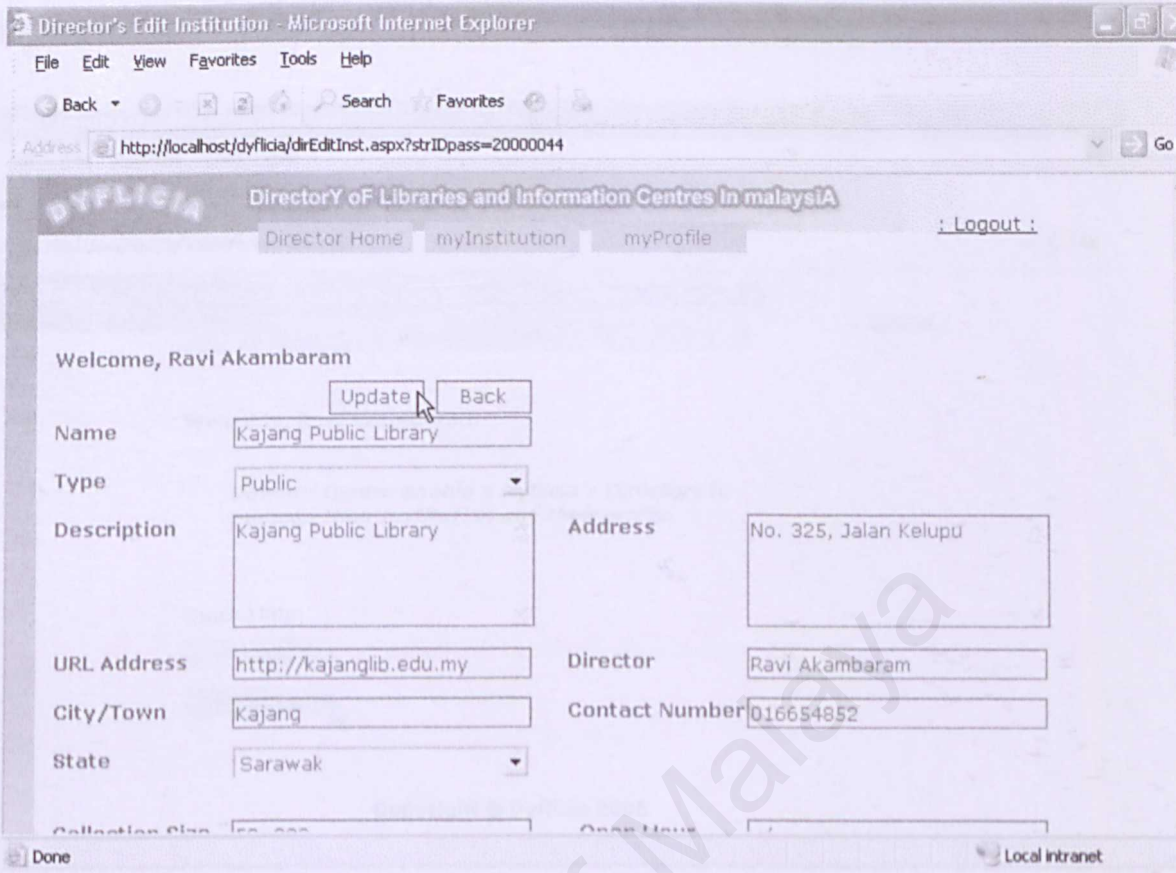

Figure 14 – Edit Institution's information

iii. Change all required information.

iv. Click [Update] button to update information.

v. Please keep in mind, updating information will set the institution's status to Pending and therefore need to be approved by administrator before it can be shown for public user.

3.4 Director Edit Profile

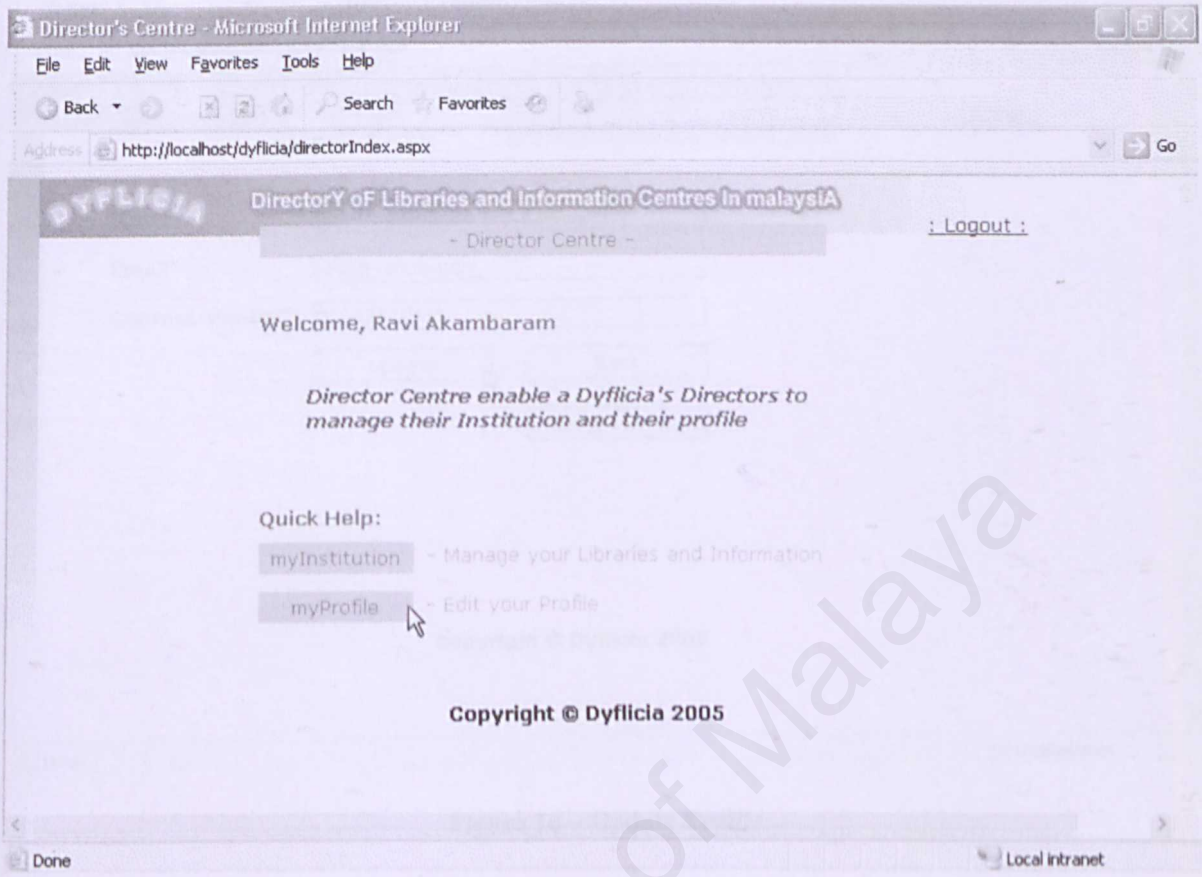

Figure 15 – Director's Centre Page

i. Click [myProfile] button from Director Centre to edit profile.

ii. The following screen is shown:

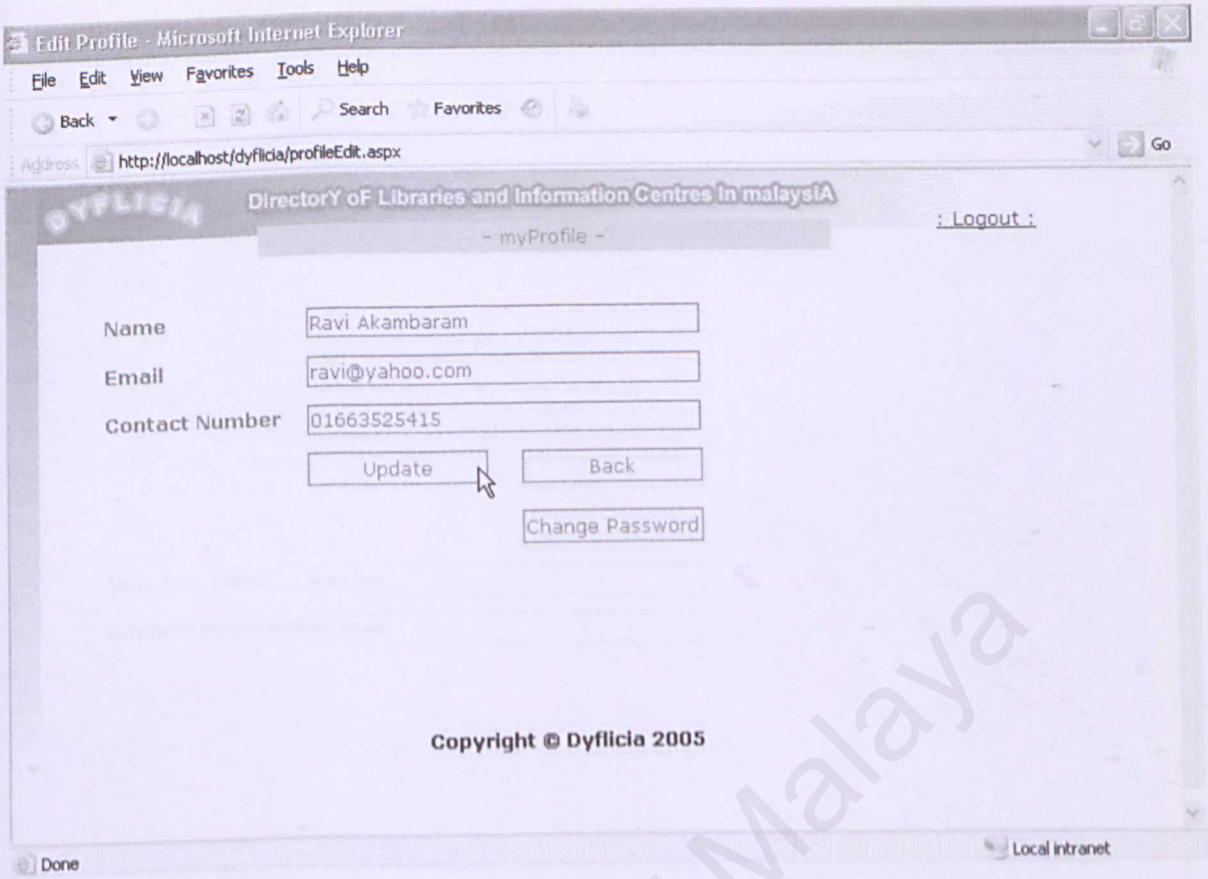

Figure 16 – Update Profile

iii. Change all required information.

iv. Click [Update] button to update profile.

v. Click [Change Password] button to change password.

vi. The following screen is shown

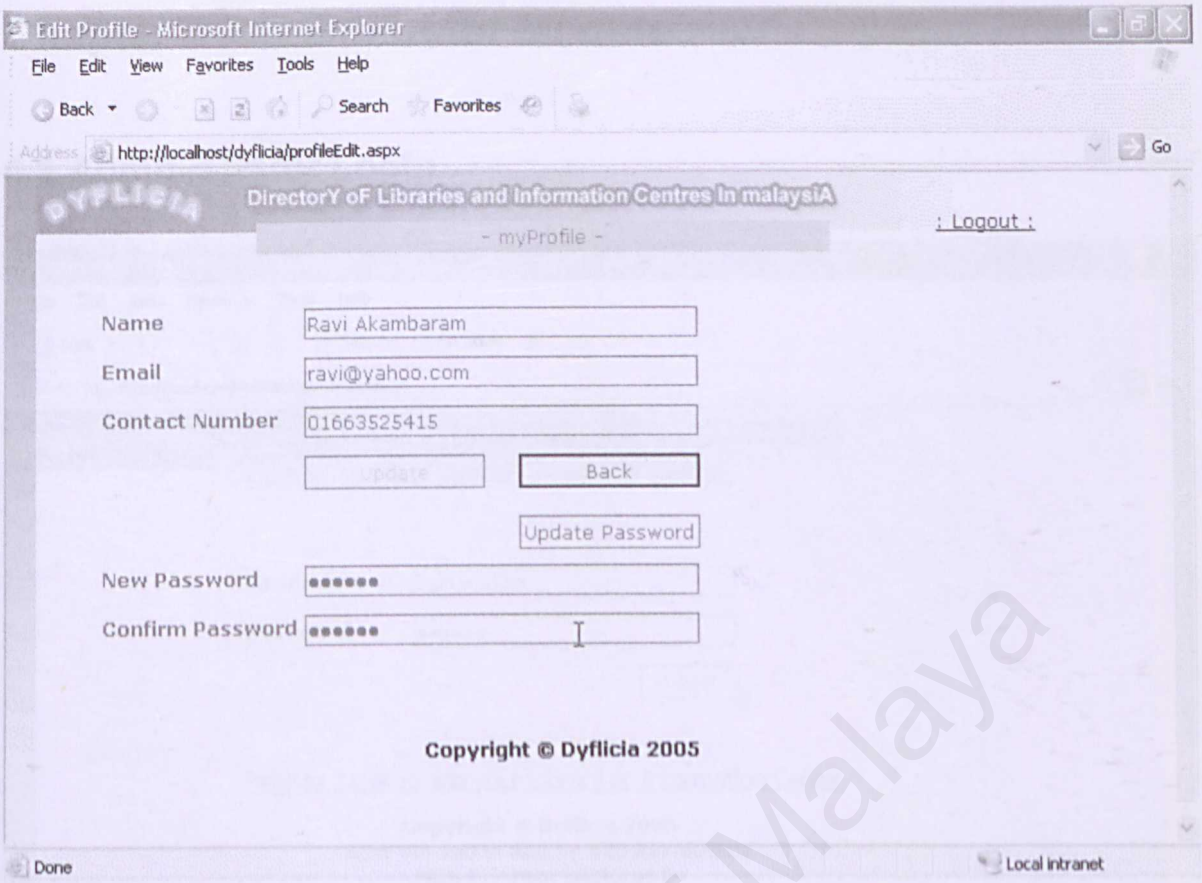

Figure 17 – Change Password

vii. Type in new password and confirm password.

viii. Click [Update] button to save new password.

ix. Click [Back] button to return to Director Centre.

3.5 Director Logout

Logout link is provided at every page at the right top side. Clicking on the [Logout] link will logout the current user.

Chapter 4 Administrator Module

4.1 Administrator Login

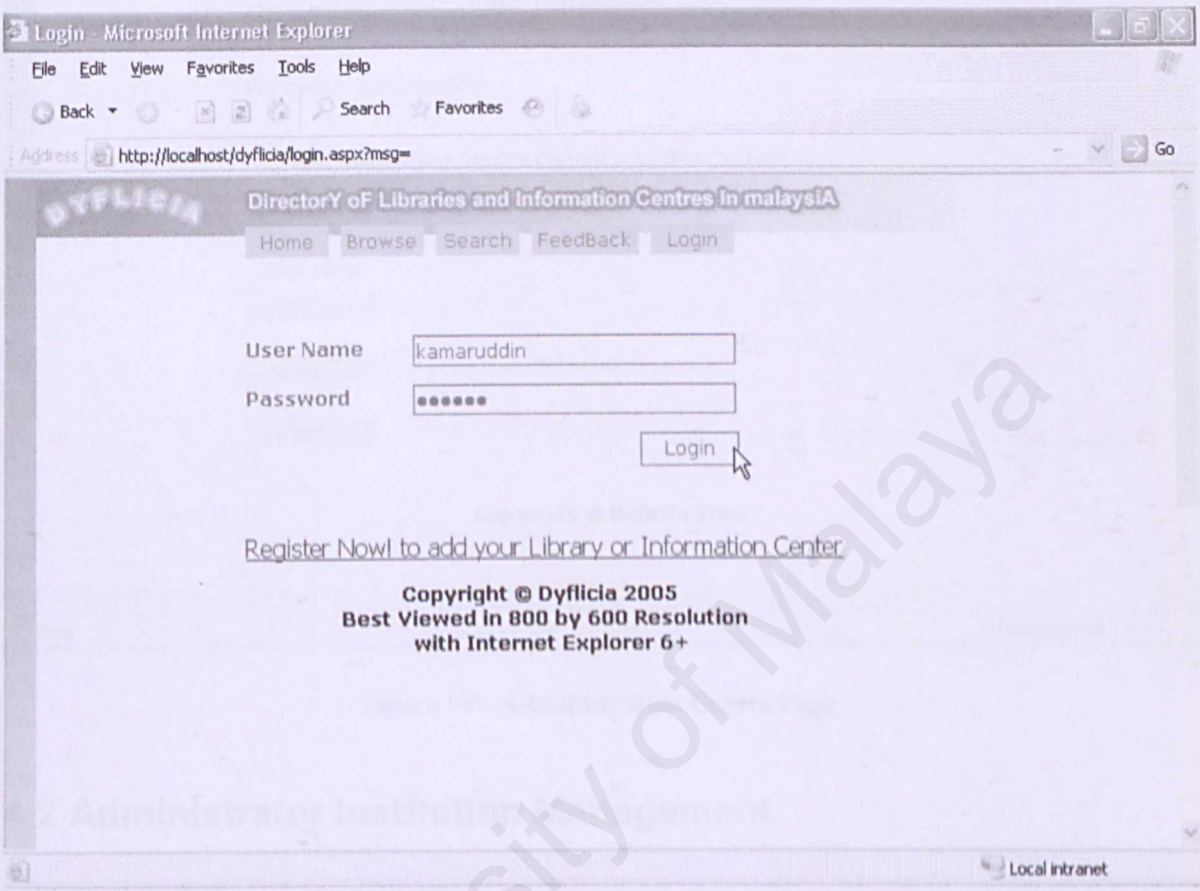

Figure 18 – Administrator Login Page

i. Click [Login] button from the main page to load the Login Page

ii. Type in username and password to login.

iii. Administration Centre Page is shown:

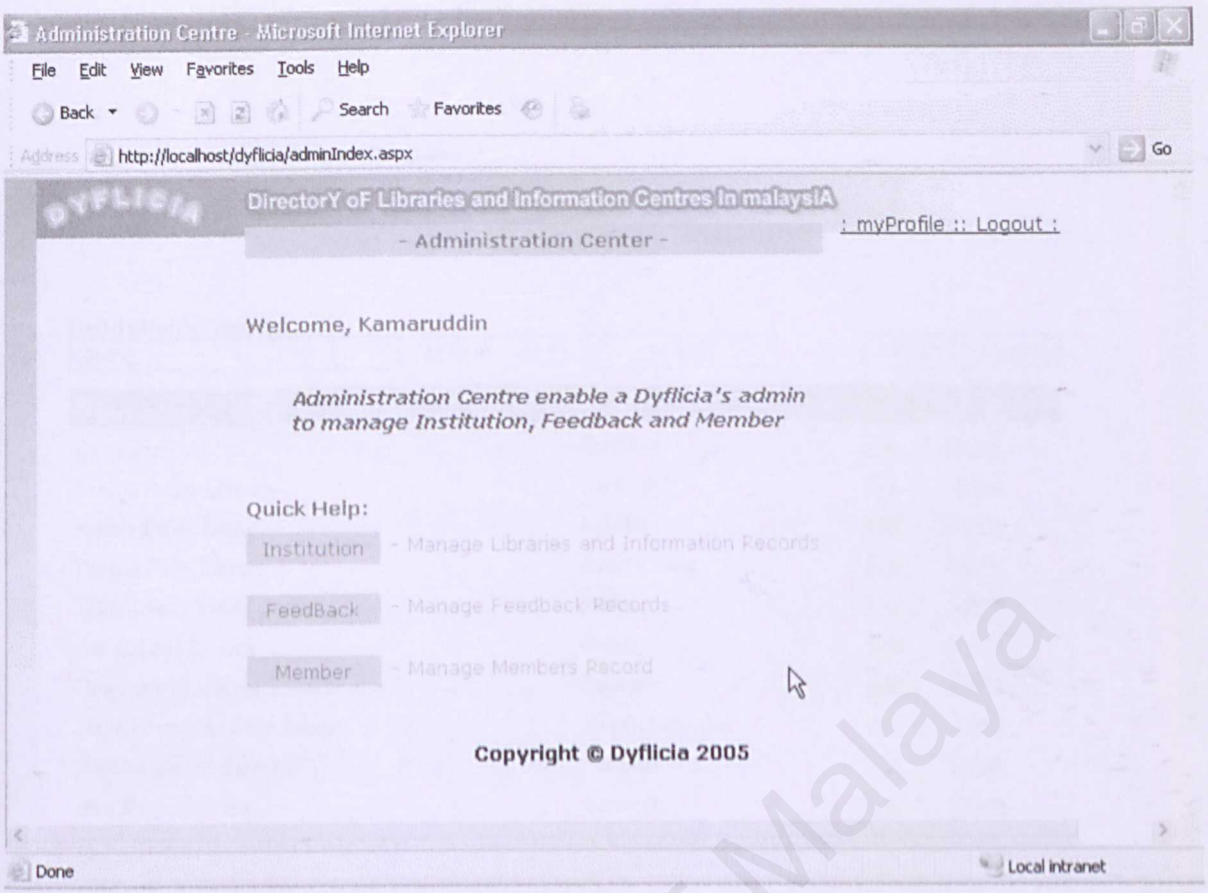

Figure 19 – Administration Centre Page

4.2 Administrator Institution Management

i. Click [Institution] button from the Administration Centre to load Institution Management Page

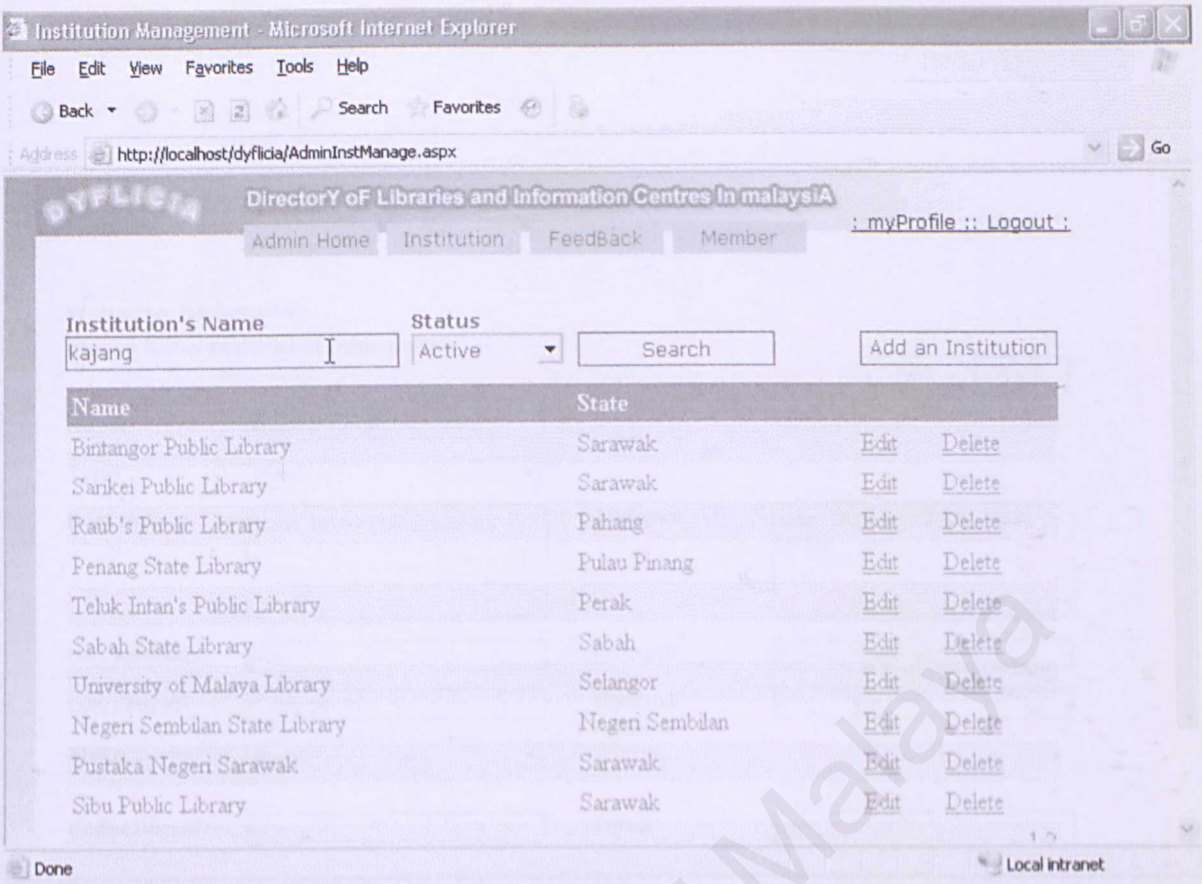

Figure 20 – Institution Management Page

ii. Type in query to search for an institution. Change status to find desired status's institution.

iii. Status are: Active (Approved for public viewing), Pending (awaiting approval), Declined (declined by administration)

4.2.1 Administrator Add Institution

i. Click [Add an Institution] button from the Institution Management Page to add an institution.

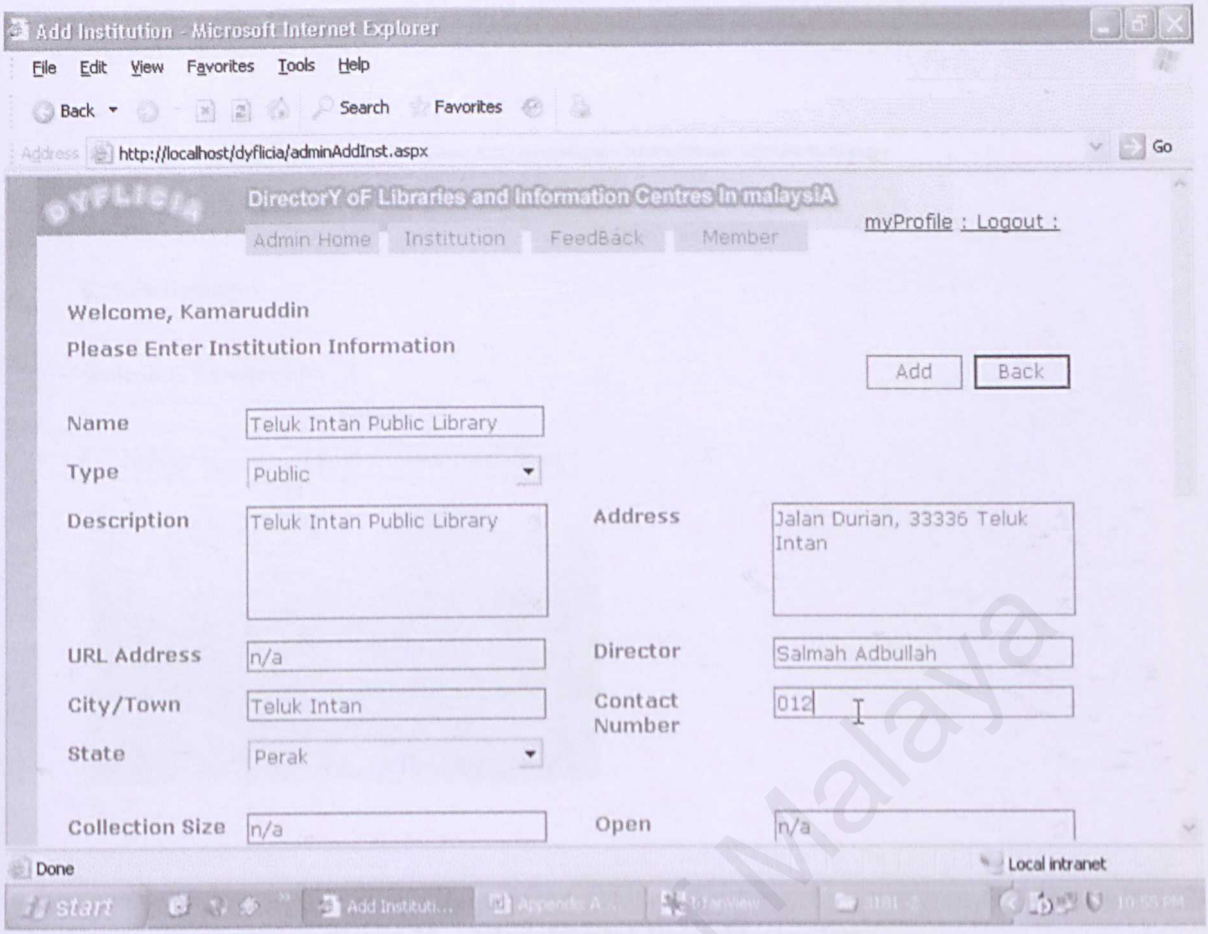

Figure 21 – Administrator (Add Institution)

ii. Fill in required information. Click [Add] button to add the new institution.

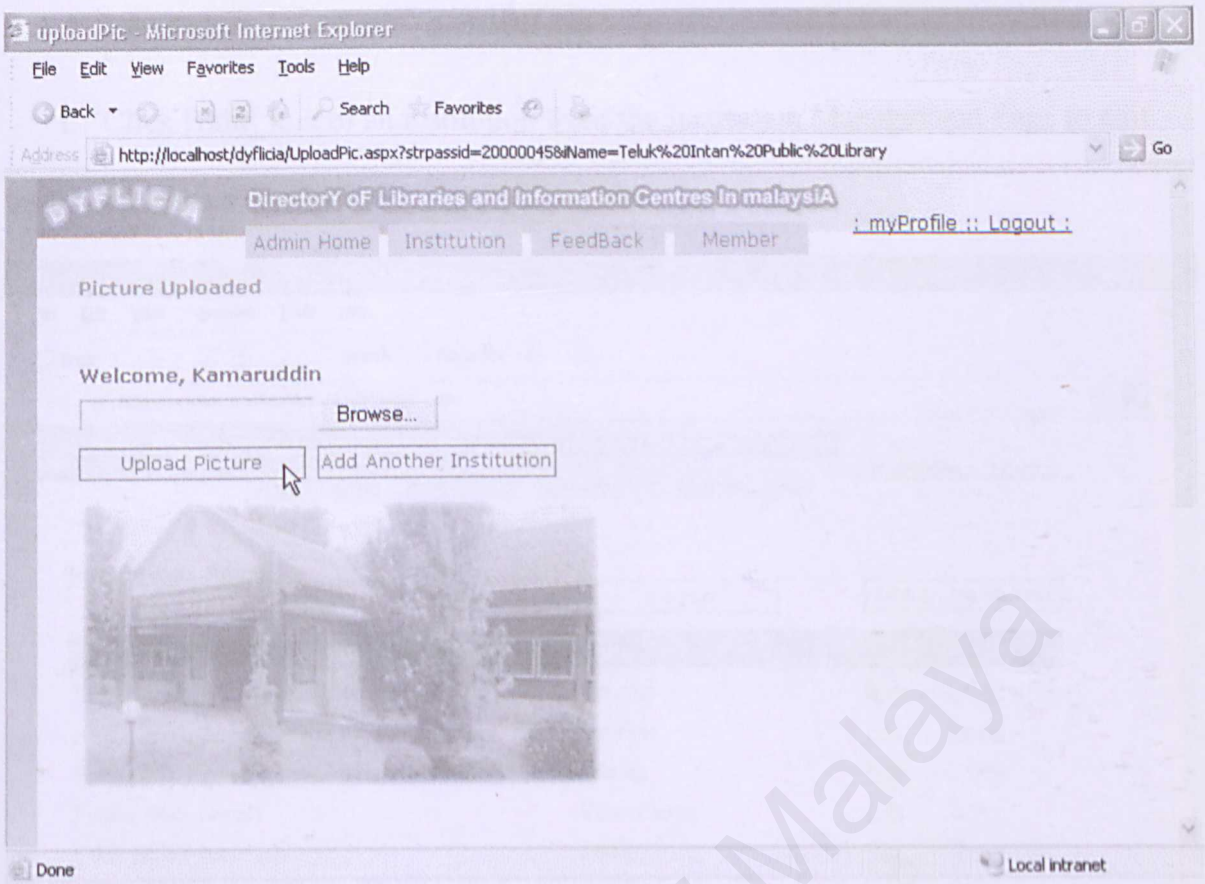

Figure 22 – Administrator Upload Image Page

iii. Click [Browse] button to choose an image.

iv. Click [Upload] button to upload chosen image.

v. Uploaded image is shown in the same page.

vi. Click [Add another institution] button to add another institution.

4.2.2 Administrator Edit Institution

i. Click [Edit] link of an institution from the Institution Management Page to edit the chosen institution.

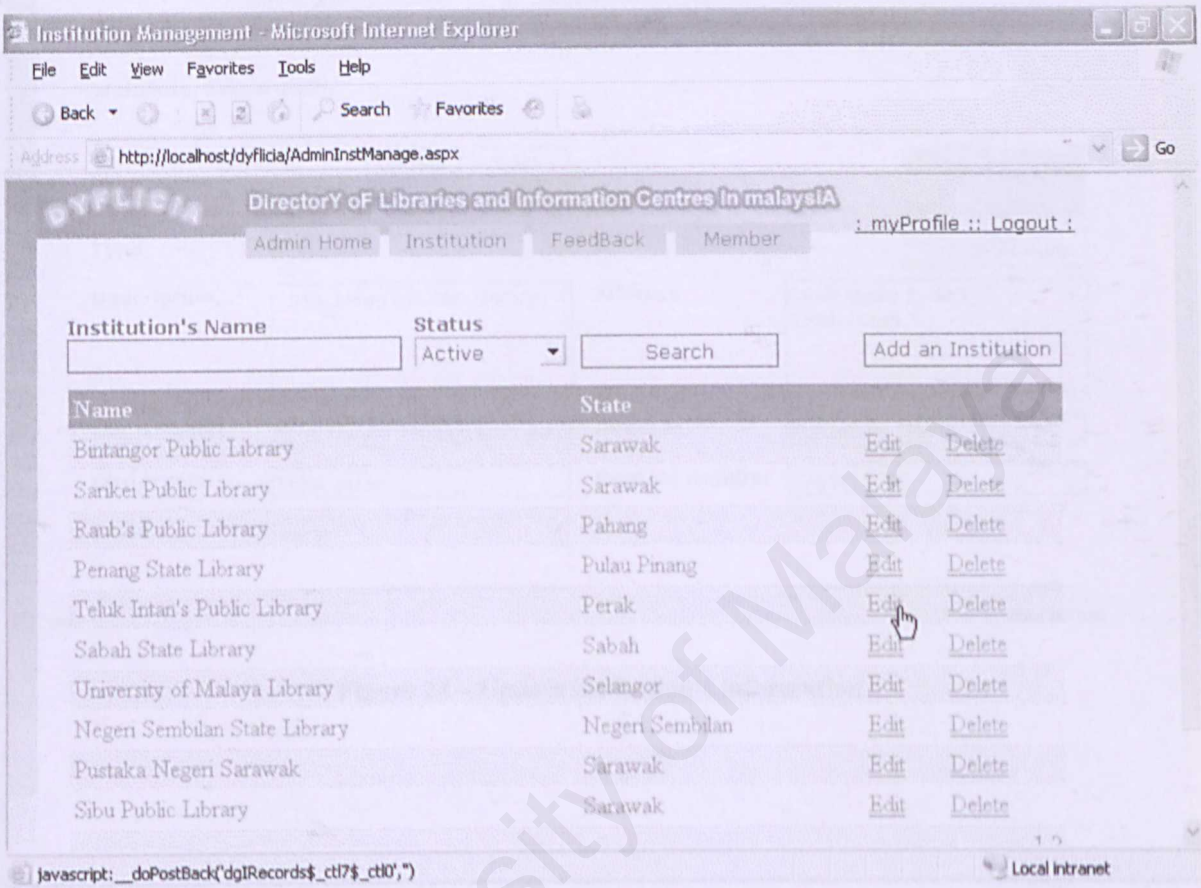

Figure 23 – The Edit Link

ii. Change all required information. Click [Update] button to save the changes.

iii. Click [Change Picture] if needed.

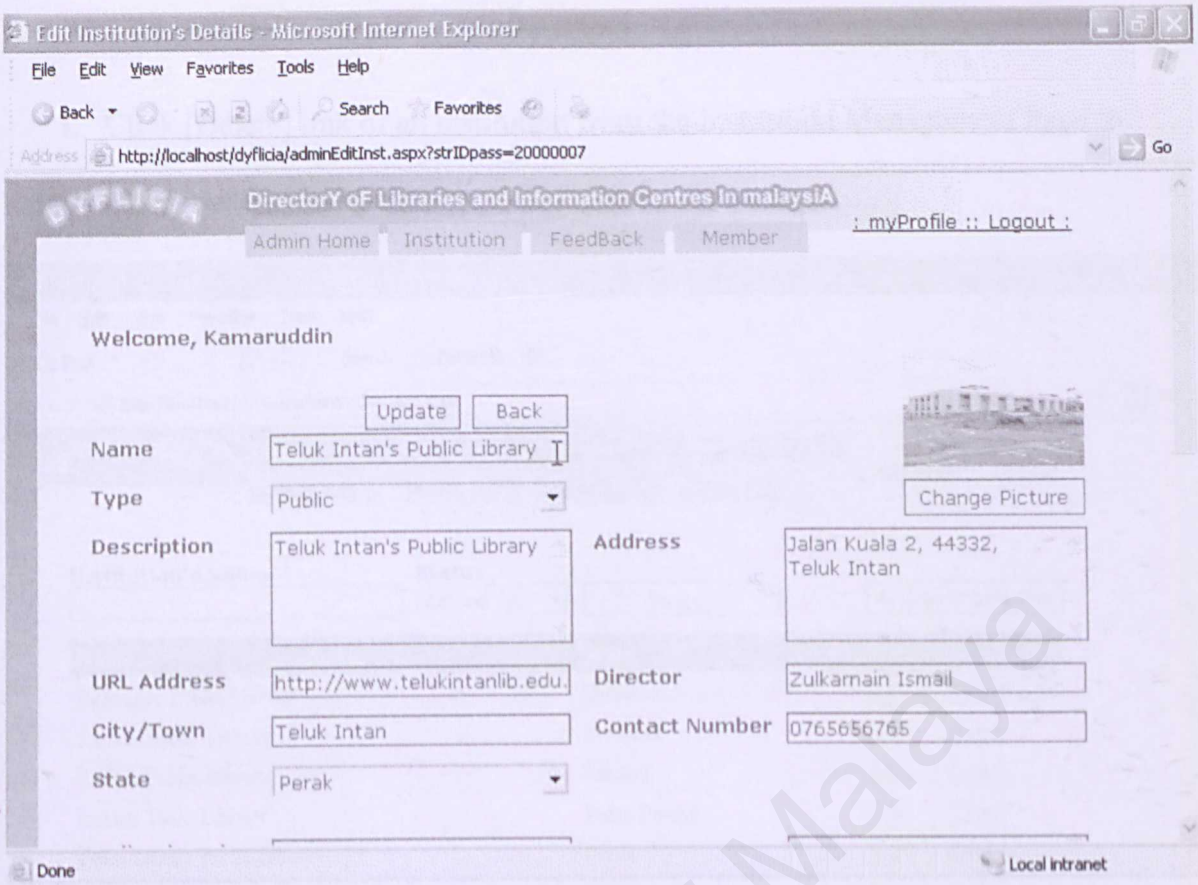

Figure 24 – Update institution's information

4.2.3 Administrator Delete Institution

i. Click [Delete] link of an institution from the Institution Management Page to delete the chosen institution.

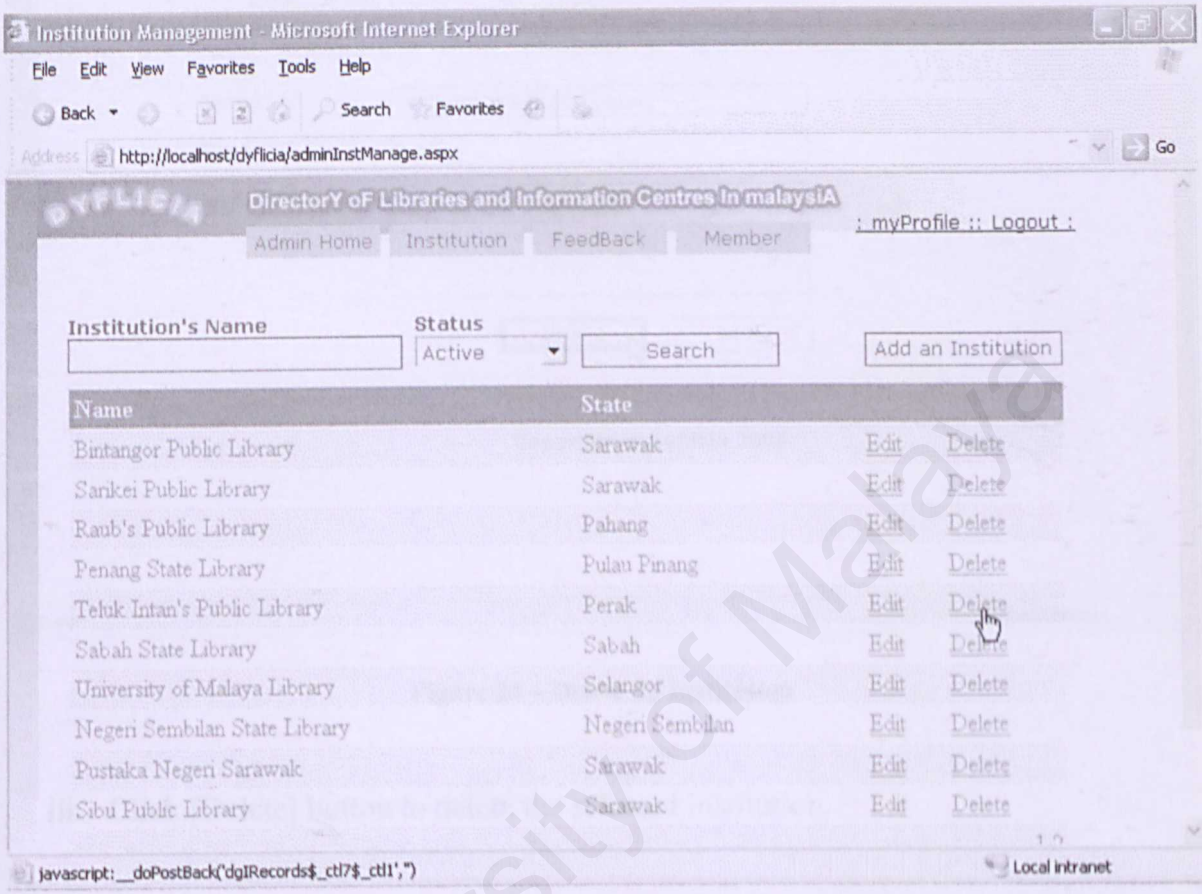

Figure 25 – The Delete Link

ii. Following screen will be shown with chosen institution's details.

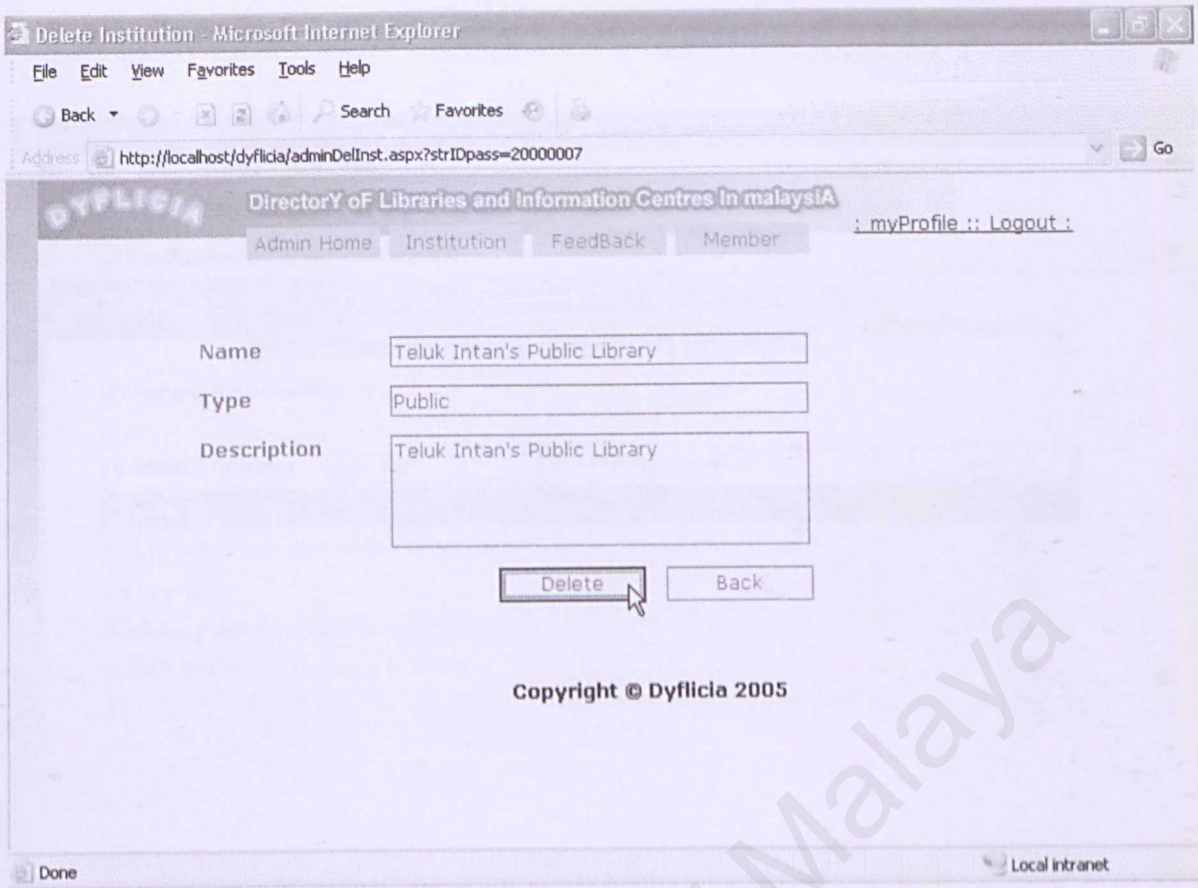

Figure 26 – Delete an Institution

iii. Click [Delete] button to delete the selected institution.

4.3 Administrator Feedback

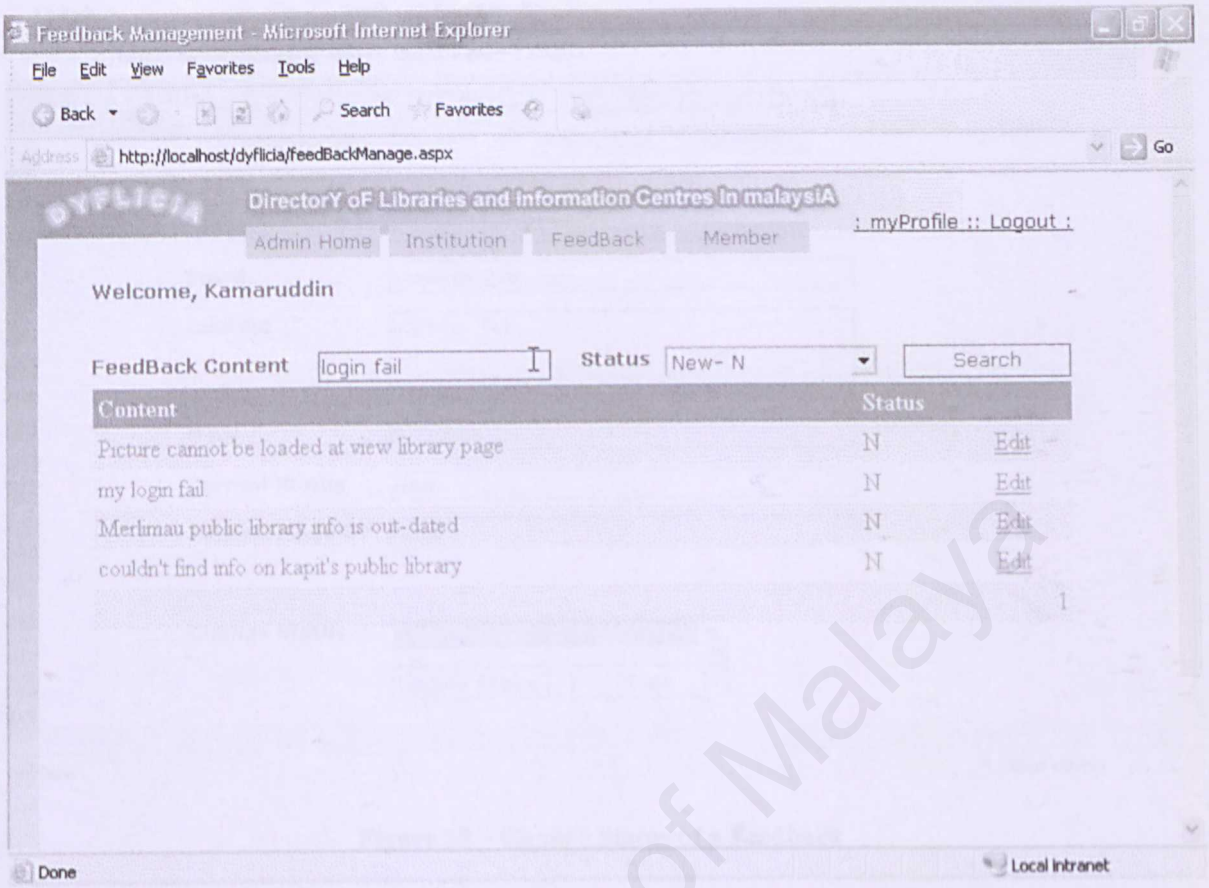

Figure 27 – Feedback Page

i. Use the Feedback content textbox and status's drop down list to search for a specified feedback.

ii. Click [Edit] link for a feedback to change its status.

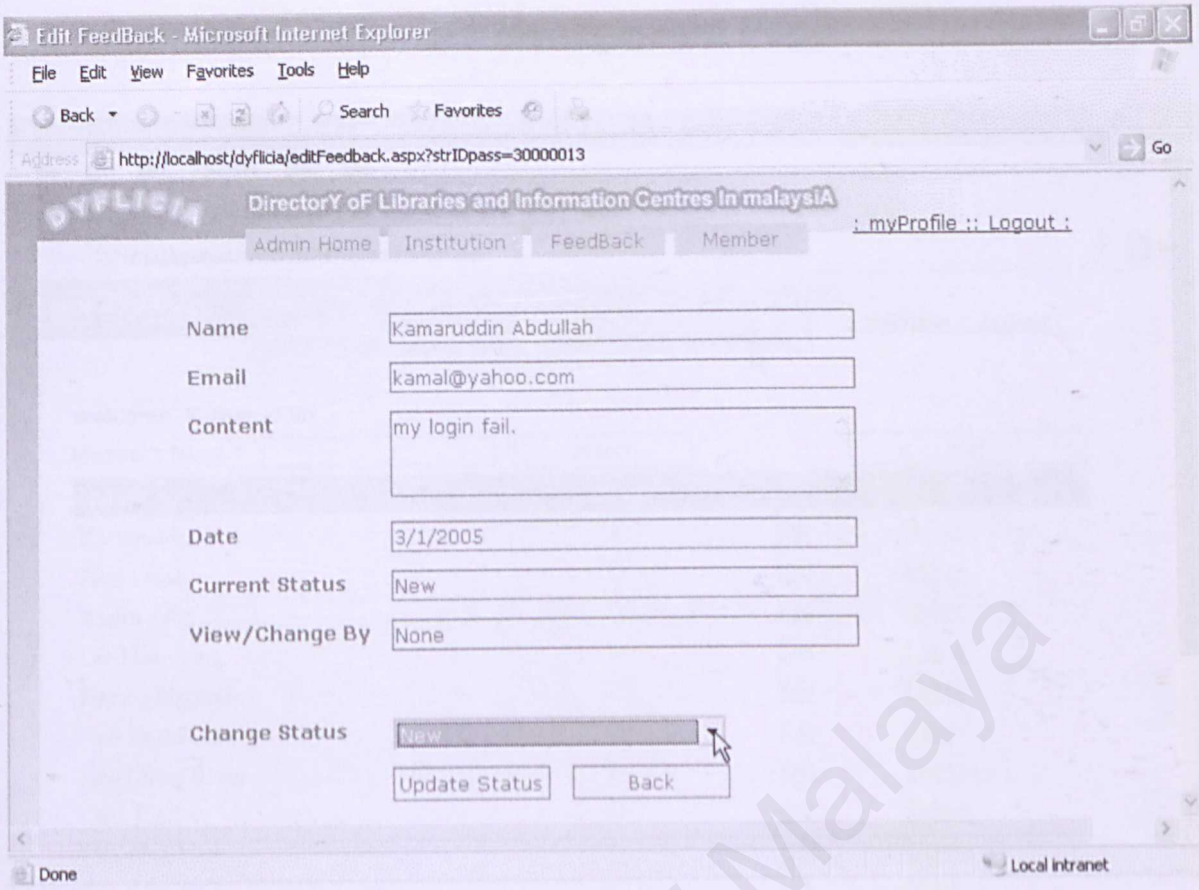

Figure 28 – Change Status of a Feedback

iii. Use the [Change Status] drop down list to change the feedback's status.

iv. Click [Update Status] button to update the feedback's status.

4.4 Administrator Member Management Page

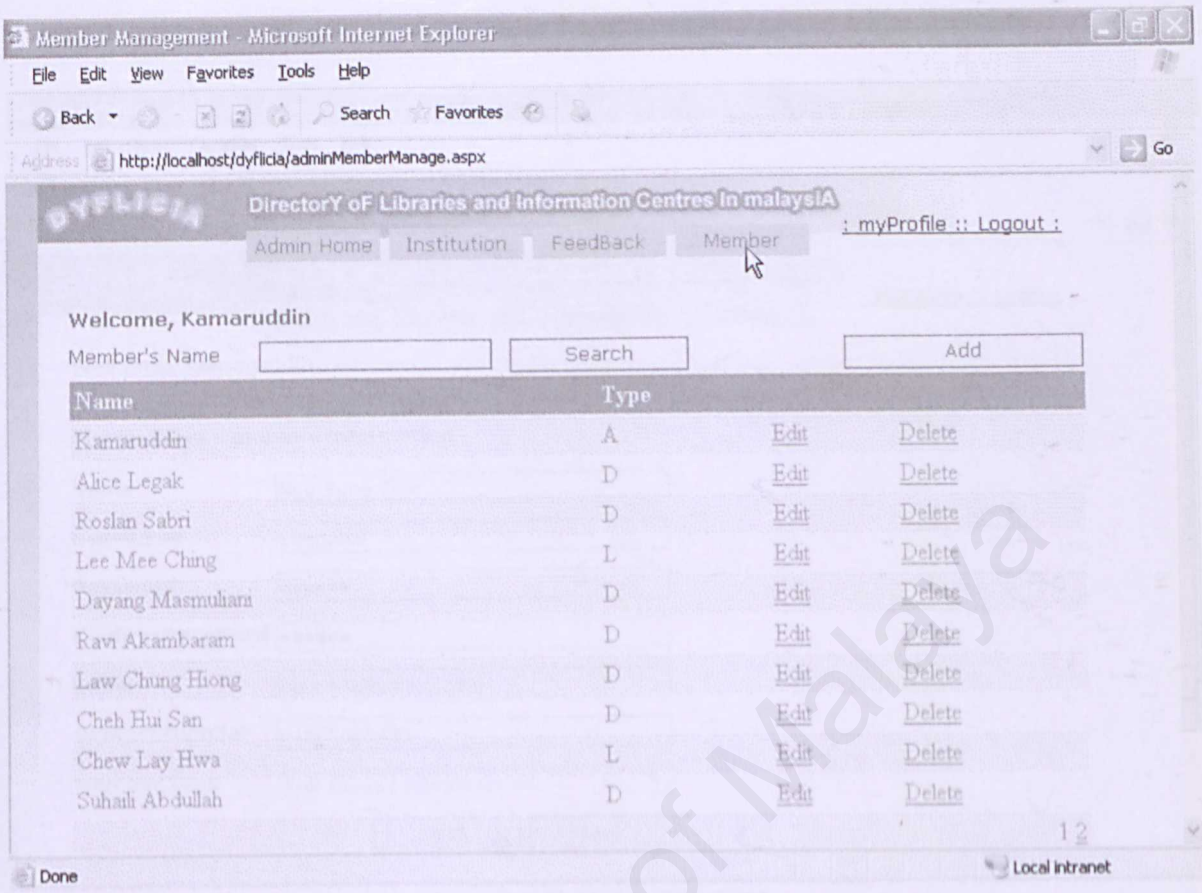

Figure 29 – Member Management Page

i. Click [Member] button to load the Member Management Page.

ii. Use the Member's Name textbox to search for a member.

4.4.1 Add Member Information

i. Click [Add] button from Member Management Page to add a member.

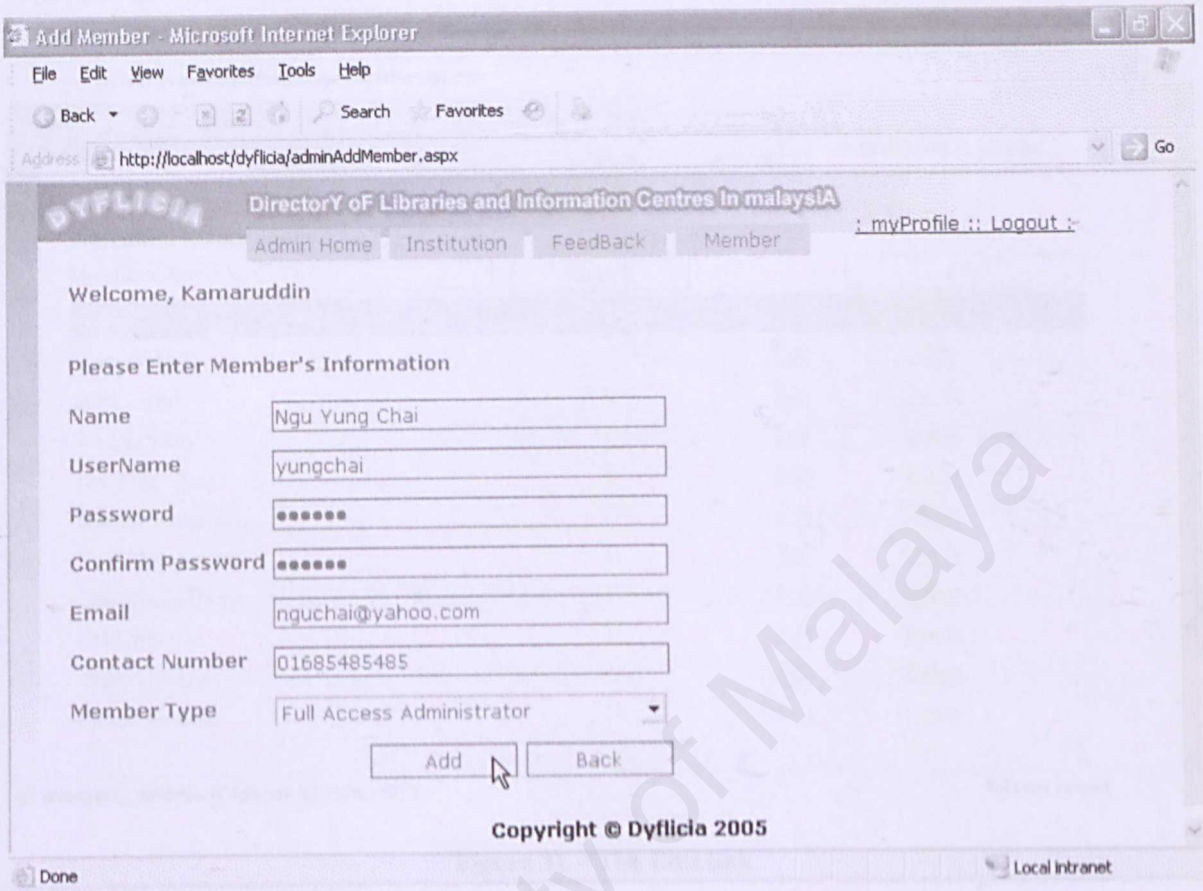

Figure 30 – Add a Member Page

ii. Fill in all required information and click [Add] button to add member.

iii. Member type – Full Access Administrator, Lower Administrator (same as administrator except do not have access to Member Management Page

4.4.2 Edit Member Information

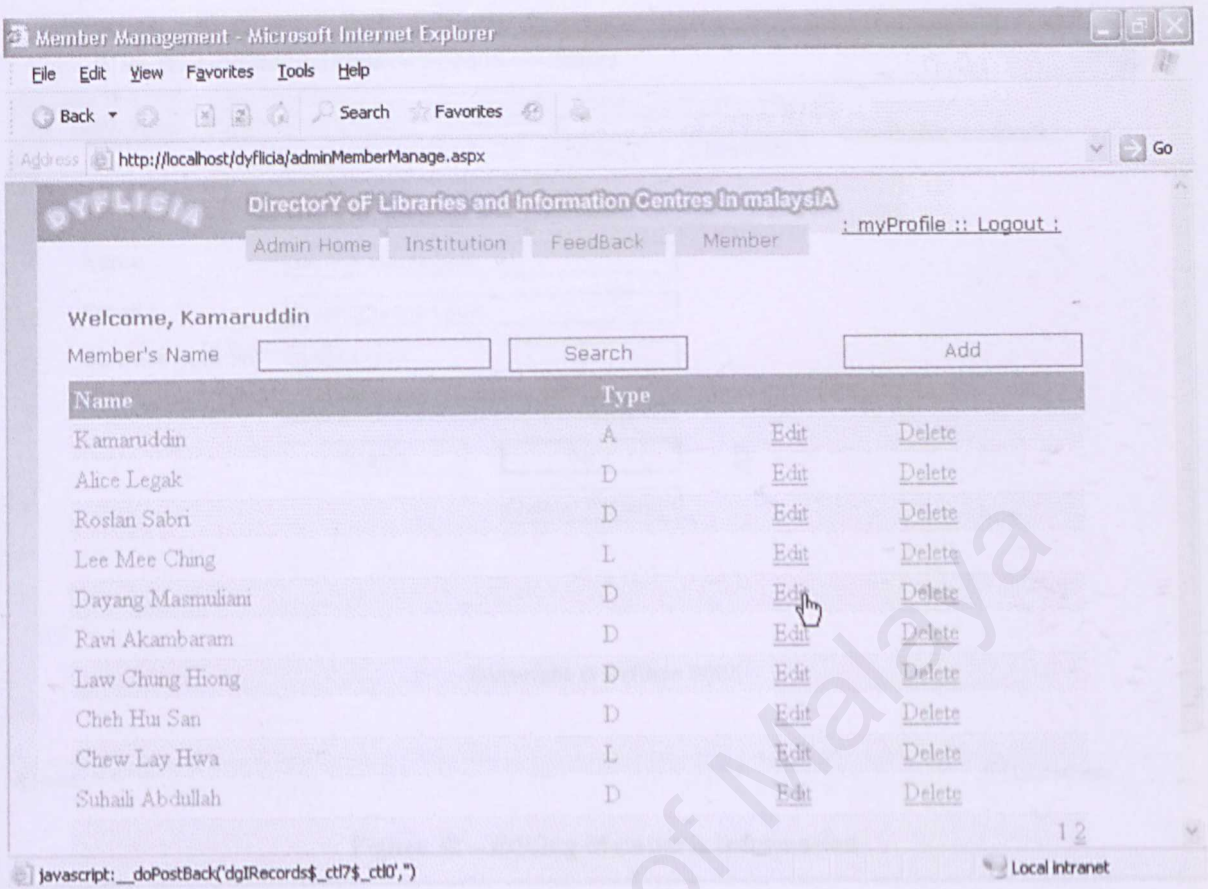

Figure 31 – The Edit link

iv. Click [Edit] link to edit a member's information

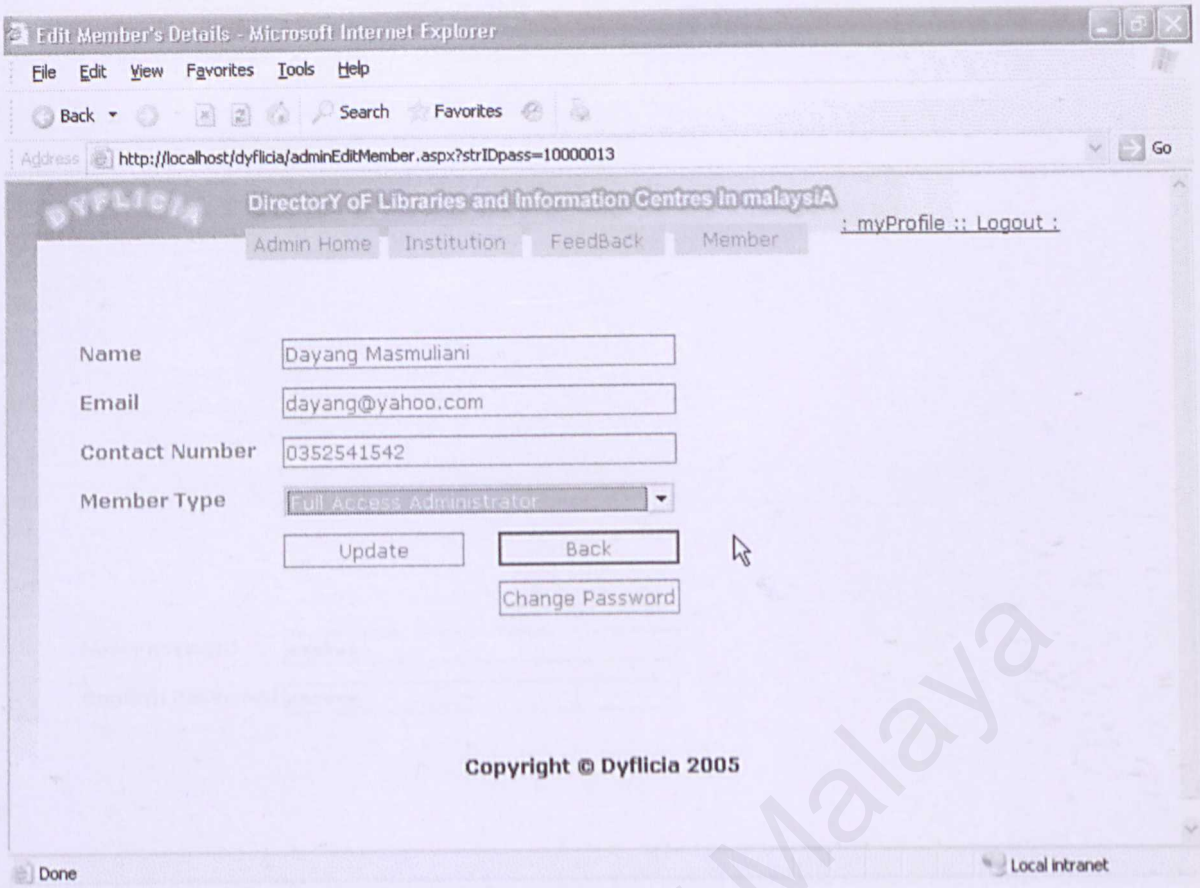

Figure 32 – Editing Member's Information

v. Modify necessary information. Click [Update] button to save the changes.

vi. Click [Change Password] button to change password.

vii. The following screen is shown

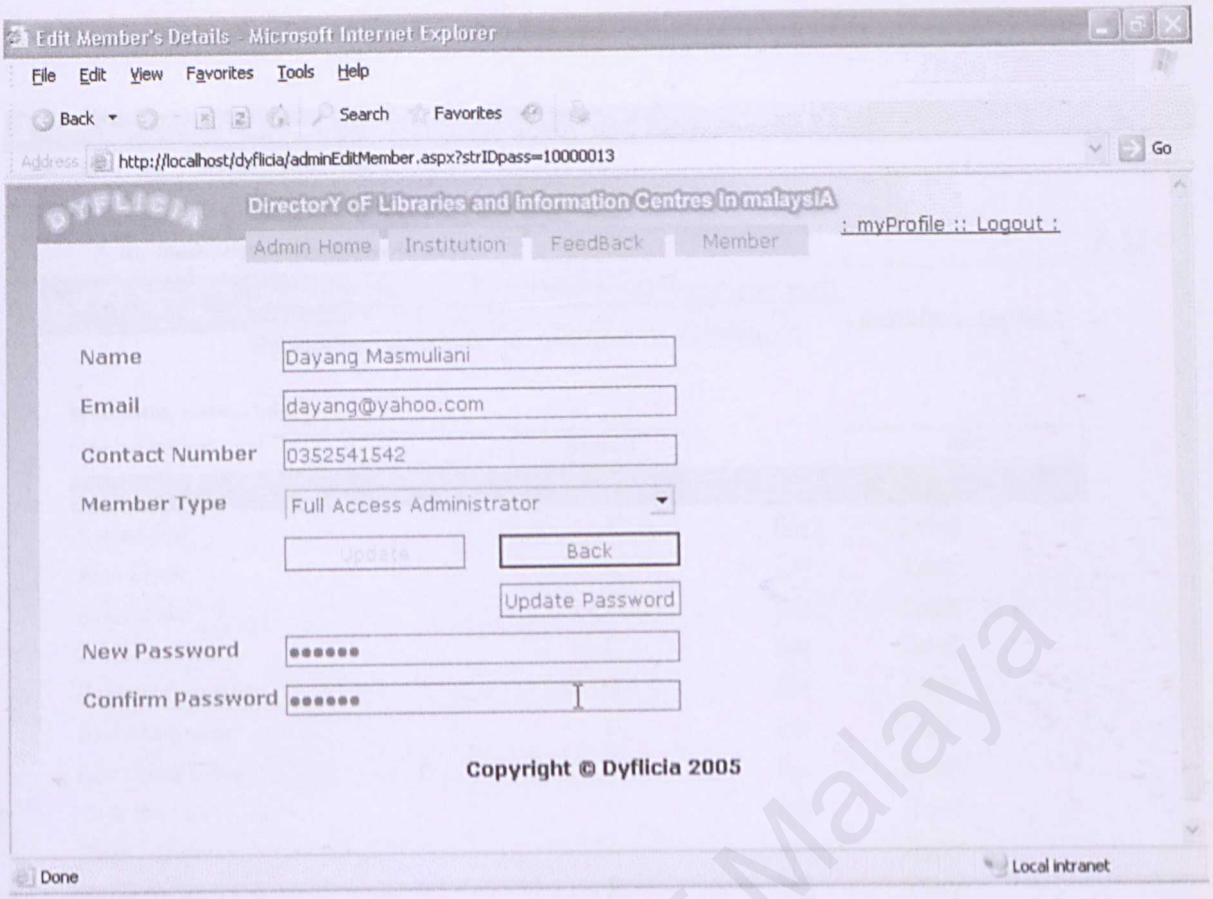

Figure 33 – Change Password

viii. Type in new password and confirm password.

ix. Click [Update] button to save new password.

x. Click [Back] button to return to Director Centre.

4.4.3 Administrator Delete Member

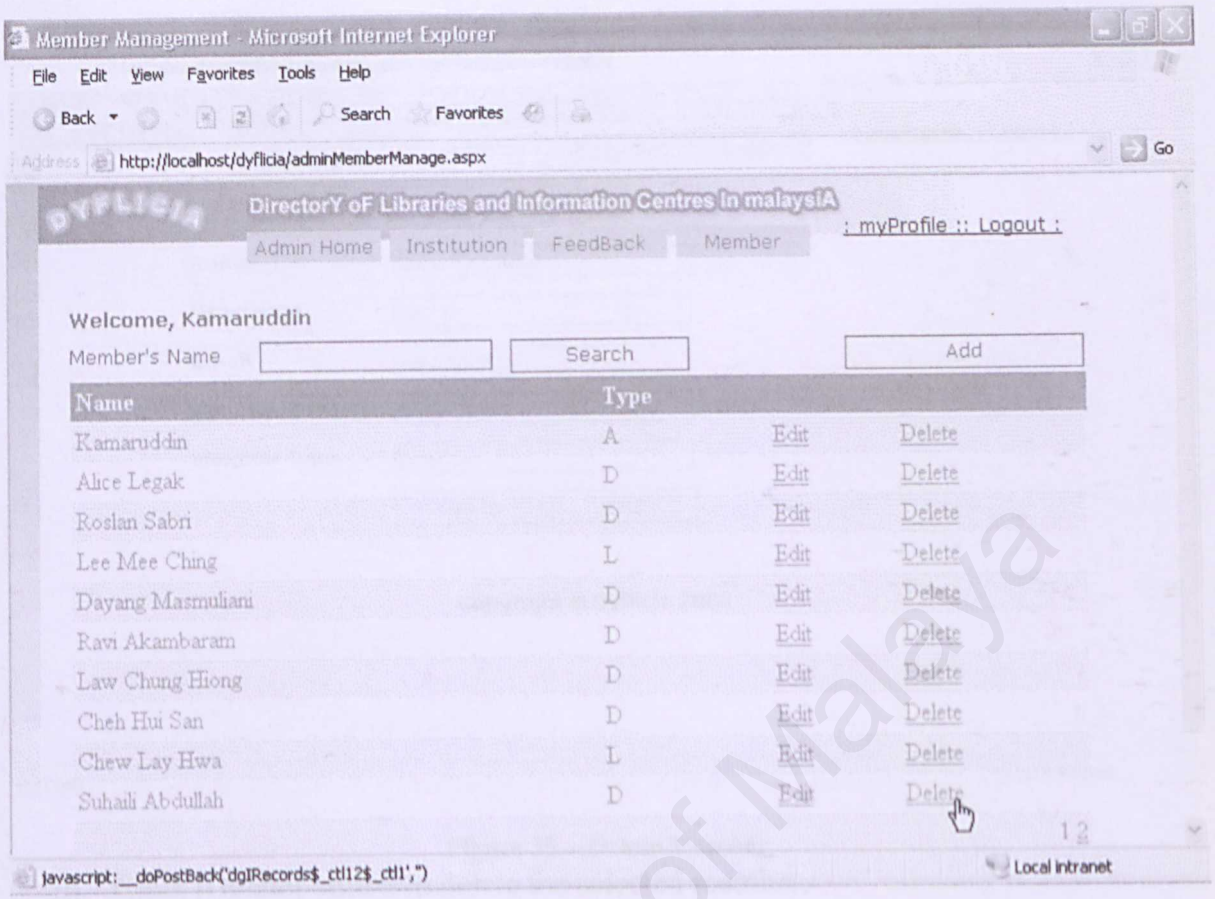

Figure 34 – The Delete Link

i. Click [Delete] link of a member from the Member Management Page to delete the chosen member.

ii. Following screen will be shown with chosen member's details.

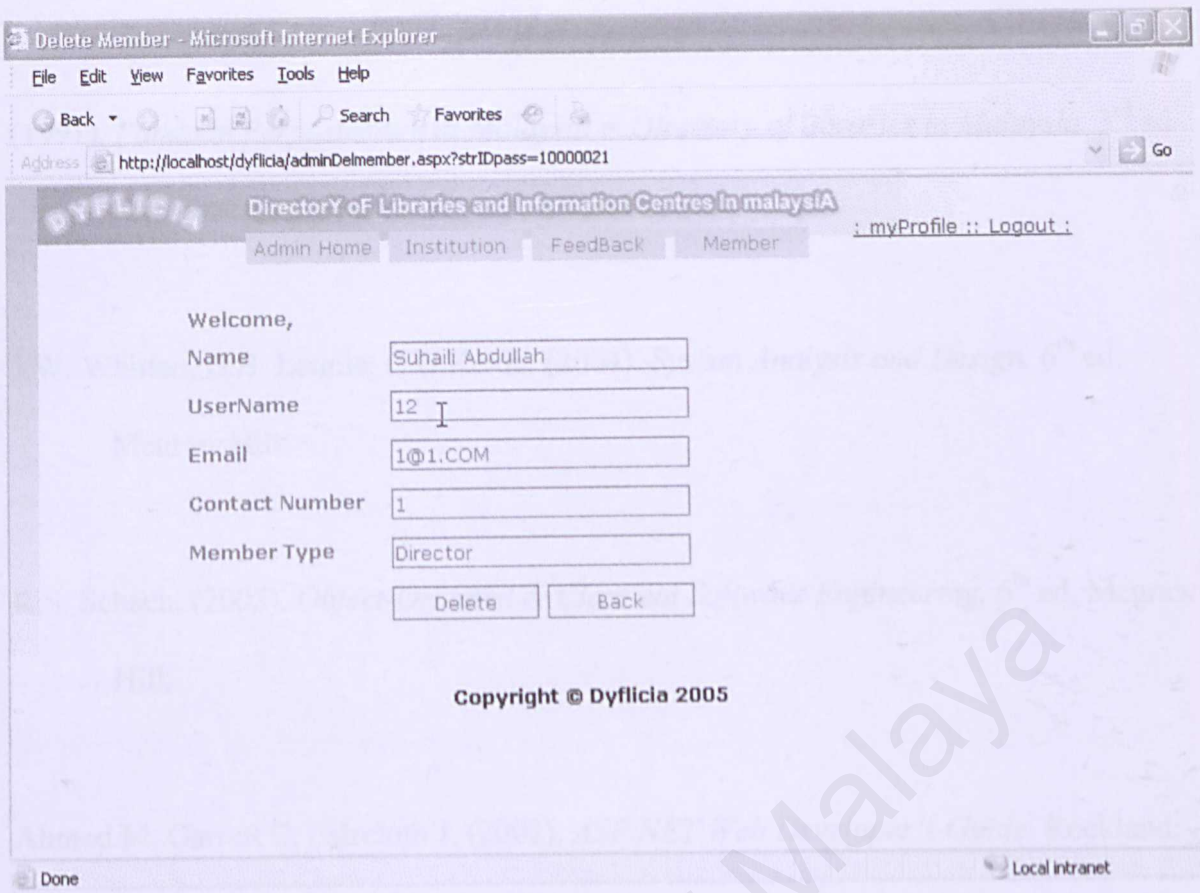

Figure 35 – Delete Member

iii. Click [Delete] button to delete the selected member.

4.5 Administrator Logout

Logout link is provided at every page at the right top side. Clicking on the [Logout] link will logout the current administrator.

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